Draft Compilation of EPA Responses to Public Comments for Insertion into the Explanation of Significant Differences Responsiveness Summary Document

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Note: This document is a compilation of the final response worksheets for use in "Reading Room." Responses are organized by their original worksheet number. The responsiveness summary will be organized into sections and subsections, which will vary in order from the way the responses are listed here. Summaries of comments received will also be different from what is shown. Thus, an editorial review for consistency and use of acronyms and terms throughout this working compilation of responses has not been done and there may be inconsistencies. They will be addressed in the responsiveness summary.

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1.0 Do Not Modify the 2017 ROD Remedy

1.1 Comments

Most comments received have at their core the sentiment that EPA should not deviate from the ROD. The two largest group mailings both ask that the ESD changes be rejected. A variety of reasons are given and covered in separate response topics. Detailed comments were also received from: Yakama Nation, League of Women Voters, and Portland Harbor Community Coalition.

- Comment 1.1. Your "new research" is flawed. Every inch of the original plan, WHICH TOOK 16 YEARS TO FINALIZE, should be part of the clean up.
- Comment 3.1. I live nearby to the river and often use Cathedral Park. I'd love to be able to use the river beach again with my young children and fish, swim, etc. The lowering of the thresholds for contaminants in this area concerns me greatly and affects many of the areas of the rivers I like to be near or use. Please continue to clean up the river at the previously approved year 2000 levels of cPAH removal to return the river to it's cleanest possible state for this and future generations.
- Comment 4.1. Normally, I would try to craft an argument to support my opinion, but I don't have the time nor the background in this specific area to support it well. That said, from what I have read, the EPA is looking to reduce what is required in terms of clean up of the North Portland Harbor site. Please do not reduce what is required in terms of clean up. The thought of a reduction scares me and I don't often scare at this sort of thing. North Portland is one of the fastest growing parts of the Portland area and from what I have read and heard is will be growing even faster in the future. Please respect the P in EPA and protect our citizens from pollutants in our local water ways.
- Comment 6.1. As a long-time resident of Portland, I am appalled at the proposed changes to require less sediment capping and removal of cPAHs and other targeted chemicals based on research showing a reduced health risk. Many children go down to Cathedral Park and play near the water. There is a boat launch for fishing and recreational boats. People kayak around the area as well. We have a moral obligation to the future generations of Portlanders to thoroughly and efficiently clean up this toxic mess.
- Comment 7.1. There is a reason our communities rallied in record-breaking numbers to push polluters and our federal organization to protect the environment, you at the EPA, into a more robust cleanup of the Willamette River. The cleanup plan you previously approved was already less robust than what the community had wanted, so reducing the plan any further would be a major step in the wrong direction. I was an attendee on webinars offered that clearly outlined the need to complete as much as possible as soon as possible. That included cleanup of a dangerous chemical known as benzo[a]pyrene. It would also clearly leave our most-vulnerable communities and the future residents with footing the immeasurable expenses of a more toxic river for generations to come. The reduction changes are unacceptable.
- Comment 8.1. Please protect the environment. It has been as far back or further than Clinton's worthless toxic site designations for clean up, where the Willamette Harbor was a

severe toxic site. Of course this was aloud and proud on his way out and nothing to fund it. It has continued to be frightening for us. My President is President Trump is President to us all, even if too many people didn't vote for him. I know businesses want to be competitive and we want money for many things, but I'll beg if I must, keep a promise. Do not shrink the quality or quantity of the cleanup in this Harbor. How can we continue to say we are the most beautiful when we are killing and allowing old poison to sit in our waterways??

- Comment 10.1. I do not support the rollback of the cleanup of the Willamette. Toxins have no place in our waterways.
- Comment 11.1. I was shocked to learn that the EPA is considering a significant decrease in the cleanup of toxic waste on an 11 mile stretch of the Willamette river in Oregon. In case you are unaware, this river is the main river moving through Portland and feeding into the Columbia and into the Pacific Ocean. Not only is this river the lifeblood of our region, it feeds fisherman, it nourishes plants and animals and when the water evaporates it rains down on our city. We needed a clean river yesterday, please reconsider your plan to decrease cleanup and instead consider a more proactive solution to toxic waste in our river. For humans, for fish and wildlife and plants.
- Comment 13.1. I am opposed to the newest plan to severely cut back the Willamette River toxic chemical clean up. This is unacceptable and I urge you to reconsider this ill conceived plan.
- Comment 16.1. It is important that polluters are held responsible in the cleanup of the Willamette River Superfund site. Please do not lower standards and allow carcinogens to remain. We owe it to Native peoples and future generations to return the river to a safe and clean waterway.
- Comment 17.1. As a Portland father of 4 and 10-year-old children, I implore you, Please do not reduce your original cleanup commitment to the citizens and creatures of the Willamette River watershed. We disagree with the EPAs new classification of benzopyrene as a low carcinogen risk. Whether benzopyrene is a significant carcinogen risk or not, there are still proven detrimental effects to respiratory and reproductive systems of human beings caused by this harmful chemical. Please, We implore you to maintaining your original commitment to our beautiful river's cleanup.
- Comment 18.1. Regarding this "ESD": The proposal to decrease and therefore limit the extent of cleanup of the Portland Harbor Superfund site demonstrates criminal neglect of responsibility to the citizens of our city and particularly to those most affected by the dangers, the health risks, the illnesses borne historically by residents of the area. The inadequate, incomplete, touted scientific studies intended to support your proposal, dont hold water...even toxic water. In summary, I urge you to reject this proposal as unworthy of consideration based on the facts.
- Comment 19.1. I write as a concerned citizen, and I am baffled at the Proposed Changes to the Portland Harbor Cleanup Plan. I strongly object to these proposed changes. The rationale to reduce the Superfund site cleanup on the basis that a carcinogenic polycyclic

aromatic hydrocarbon is less carcinogenic than initially believed is shortsighted and harmful to the aquatic and human life in the area.

- Comment 20.1. As a nearby resident, the health of the river impacts me and my family. I encourage the EPA to not change or rollback any cleanup plans without further research into the dangers posed by benzo[a]pyrene and other carcinogens, including heavy metals. The EPA should apply the precautionary principle, and take action to protect human health until the risk to human health can be proven to be zero. Findings that bezo[a]pyrene isn't as dangerous as previously thought is a comfort, but it does not mean it is safe. Protecting the health of the public should be the top priority.

- Comment 21.1. As a Portland resident, river swimmer, and as someone who recognizes that Portland's most vulnerable communities often shoulder the heaviest burden of exposure to pollutants, I strongly object to the proposed changes, or Explanation of Significant Differences, that would reduce the level of cleanup required for benzopyrene.

- Comment 24.1. I am writing to express my opposition of the proposed EPA guidelines to alter the cleanup plans for the Willamette river in Oregon.

- Comment 25.1. I am writing to urge the epa not let nw natural and the port of Portland of the hook by lessening the clean up of the superfund site on the willamette river. I am aware of the recent study that has prompted the proposed changes. I have an issue of National Geographic from the 70's that I celebrating the revival of the willamette. A river from which it is still advisable to not eat fish from. Whatever study's come out the issue will remain that the river is unhealthy.

- Comment 26.2. The EPA exists to help our communities solve problems. It exists to help us clean up historic actions of the privileged few, who can pollute without consequence. But there are consequences--and they are felt by the communities that have used the river and its resources for survival. Now it's time for the EPA to help, rather than further the injustices of the polluters of the past.

- Comment 28.3. All things considered, the proposal to weaken the Willamette River Superfund site is, at best, a potentially catastrophic rush to judgement, and at worst, a bad faith effort to undermine the bare minimums of environmental stewardship. Neither line of reasoning is acceptable. As a concerned citizen, I am urging the EPA to withdraw its proposal to weaken the cleanup efforts at the Willamette River Superfund site. In fact, I would go a step further and encourage the agency to expand the cleanup as a show of commitment to fighting the larger, existential threats of climate change and environmental damage.

- Group A Comments (628 of these). The community surrounding the Portland Harbor have dedicated time, effort, and resources for a cleanup plan that will restore the river to safe levels. It should not be expected to compromise its health and the health of the river, not for $35 million and 17 acres of reduced effort. Maintain the plan outlined in the 2017 Record of Decision and abide by the timeline for revisions that are established in the Superfund cleanup process.

- Group B Comment (289 of these). I am writing to urge you to reject proposed changes to the 2017 Portland Harbor Superfund Cleanup Plan after more than 16 years of public process. The public has waited nearly two decades for the cleanup to begin and it is time to move forward with implementing the 2017 plan as written. The changes proposed in the "Explanation of Significant Differences" (ESD) that was released by the EPA in October 2018 would reduce the threat risk associated with carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and leave people, fish and wildlife at continued risk of unnecessary exposure to these toxic chemicals in Portland Harbor indefinitely. I am particularly concerned that the EPA is proposing to eliminate dredging and removal of approximately 17 acres of river bottom that are highly contaminated with cPAHs at NW Natural "GasCo Site" and the Port of Portland's "Terminal 4" as required in the 2017 plan. NW Natural and the Port of Portland have been two of the most aggressive advocates for a weaker cleanup plan and the proposed changes will save them $35 million in cleanup costs at the expense of the health of our communities and our environment. It's time for the EPA to move forward with the cleanup plan that was adopted, not work behind the scenes with polluters to weaken the plan. Implementation of the plan is already behind schedule. I appreciate that EPA has recently sent a strong message to responsible parties that they need to move forward expeditiously to develop cleanup agreements and start the cleanup process. However, the proposed changes undermine public confidence that EPA is committed to moving forward. After nearly two decades, EPA needs to focus all its resources on moving the 2017 plan to implementation and our river towards health. Please reject the changes in the ESD.
- Comment 1076. Hi As a St. Johns resident I request that the levels for BAP's not be down -- we want the levels and cleanup to be done so the river water is as safe as all other parts fo the river.

1.2 Draft Response

The quality and protectiveness of the cleanup is not compromised by the changes in the Explanation of Significant Differences (ESD) and the EPA does not consider this ESD to be a rollback of the cleanup. With this change, the Selected Remedy remains cost-effective and balances several important factors, including maximizing risk reduction in the quickest timeframe while minimizing to the extent possible the impacts to the environment during construction; disturbance to the habitat for benthic invertebrates, fish, and wildlife; and long-term restrictions on human uses that can be allowed at capped areas.

The Portland Harbor Record of Decision (ROD) established remedial action objectives (RAOs) to address the human health and ecological risks posed by the contamination at the site. The Portland Harbor ROD also established clean up levels which are the long-term contaminant levels that need to be achieved by the cleanup to meet the RAOs. Human health risk-based sediment cleanup levels were calculated based on direct contact with beach and in-water sediment to be protective of indirect exposures through consumption of fish and shellfish. Risk-based sediment cleanup levels for cancer effects were calculated based on an excess cancer risk of 1 x 10-6 (the risk of one additional occurrence of cancer out of one million people) and risk-based cleanup levels for non-cancer effects were calculated as concentrations that would result in a hazard

quotient (HQ) of 1. The Portland Harbor ROD established a risk-based cleanup level for carcinogenic PAHs (cPAHs) based on the cancer slope factor (CSF) for BaP.

After the ROD was issued in 2017, EPA released an updated Toxicological Review of Benzo(a)pyrene (EPA, 2017) that modified the oral CSF for BaP from 7.3 to 1 mg/kg-day. This resulted in a lower risk estimate associated with exposure to BaP and other cPAHs based on research that showed that BaP is not as toxic to humans as previously thought. Because humans have less cancer risk from exposure to BaP, the updated oral CSF has implications for the development of risk-based cleanup levels (CULs), target tissue levels, and highly toxic principle threat waste (PTW) thresholds for cPAHs and remedial action levels (RALs) for total PAHs.

The changes outlined in the ESD are based on sound science and represent a more accurate estimation of the health risks associated with BaP and other cPAHs. Furthermore, it is EPA's policy to encourage appropriate remedy changes in response to advances in remediation science and technology. Because BaP is not as toxic to humans as was previously thought when the ROD was issued, changes are being made so that the cleanup at Portland Harbor is still just as protective for human health but is not based on outdated science. The new BaP toxicity information results in modifications to the cPAH CULs, target tissue levels and highly toxic PTW thresholds and the total PAH RAL for contaminated sediments outside the Navigation Channel, but these changes do not compromise the protectiveness of the Selected Remedy.

Changes to the Selected Remedy are limited to the remedial footprint in areas where cleanup is driven by PAHs and reduces the total remedial footprint by 17 acres, the capping area by 8 acres, and the dredging volume by 43,800 cy. These reductions in active remedial footprint are a small fraction of the overall scope of the Selected Remedy.

The changes outlined in the ESD are consistent with the original objectives of the Selected Remedy. The Selected Remedy still reduces risks within a reasonable time frame, is practicable, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. The Selected Remedy will continue to achieve substantial risk reduction by dredging and capping areas with the most contaminated sediments, reduce remaining risks to the extent practicable through ENR and MNR, and manage remaining risks to human health through institutional controls. The Selected Remedy still includes considerations to reduce cancer and non-cancer risks to levels acceptable for human health and ecological exposure, including people working along, on and in the river; using the river for recreational purposes; living along the shoreline for a limited period (two years), using river water for drinking; and consuming fish and shellfish from the river.

3.0 Synergistic Effects Were Not Evaluated

3.1 Comments

General comments expressed concern that the synergistic or combined effects of COC mixtures were not adequately assessed and only risks associated with benzo(a)pyrene were evaluated in the ESD.

- Comment 2.1. The change does not take into account mixtures of PAHs, which Oregon State University scientist's research says can be more toxic than individual chemicals. Why not?

- Comment 5.3. Nor have the synergistic effects of PAHs with other chemicals been evaluated.
- Comments 12.3, 13.4, and 14.3. There is no analysis of the toxicity of benzo[a]pyrene in combination with other chemicals at the site, including PAHs, PCBs, dioxins, organic chemicals, and metals. Scientists have demonstrated that low-level exposures and combinations have powerful toxic effects, especially on developing animals across the animal kingdom.
- Comment 18.2. The studies you cite do not include data on the effects of the supposedly "less toxic" chemical, benzo(a)pyrene, when combined with the many other toxins in the River, including PAHs, PCBs, dioxins, organic chemicals and metals. Unarguably, one lone chemical cannot be considered by itself.
- Comment 21.2. No research has examined the toxicity of benzopyrene in combination with other chemicals at the Portland Harbor site, including PAHs, PCBs, dioxins, organic chemicals, and metals.
- Comment Group A (628 of these). The proposed plan also does not account for the chemical's other dangers, especially when interacting with the many contaminants within the Portland Harbor, including other PAHs, PCBs, dioxins, and more.
- Comments 1127 to 1132. Pollutant mixtures that can be more toxic than the original pollutant. EPA has not studied mixtures and cannot give assurance that they would be safe.

Technical comments from parties that provided long format documents pertaining to the topic were received from:

- Portland Harbor Community Advisory Group
- Yakama Nation
- Earthjustice
- League of Women Voters
- Portland Harbor Community Coalition
- (b) (6)

These detailed comments address the same concerns as the public comments listed above with additional concerns summarized below:

- To propose that benzo[a]pyrene can be separated from the other cancer-causing PAHs is not scientifically established. To find that one hazardous and toxic chemical is not as risky as first thought does not necessarily decrease its health risk because the synergistic processes may still result in the risk being the same.

- The same Relative Potency Factors (RPFs) that were used in the RI were used in the proposed ESD. This approach is invalid. Scientific studies from the Oregon State University and affiliated experts found that the RPFs underestimate the cancer potency for some PAHs, particularly those that function through alternative pathways or exhibit greater promotional capacity compared to benzo[a]pyrene. Just because benzo[a]pyrene has been found to be less toxic, other toxics in the same family may still be a threat.

- PAH default toxicity values are appropriate for simple sites, but not Portland Harbor. There are known, multiple, co-occurring contaminants at the GASCO site (the largest PAH source at Portland Harbor) and Terminal 4. The combinations of PAHs found in the GASCO Northwest Natural site can be viewed as synergistically more toxic; site-specific data indicates that PAH contaminated sediments at GASCO may be more toxic than the default value. EPA has not examined the combination of PAHs and other contaminants at these specific hot spots as well as beaches with known public access. How does the toxicity and uptake (by, for example, clams) of the PAH mixtures specific to GASCO compare to that of site-wide PAH mixtures?

- The ROD assumed that removing COCs (individually or collectively) would reduce concentrations and exposure to other COCs. The proposed ESD does not address co-located COCs. Specifically, by making the cPAH cleanup standards less stringent, more PCBs, dioxins, metals, other organics, would be left in place since fewer sediments contaminated with PAHs would be removed. EPA must determine whether other contaminants of concern should be the drivers for cleaning up specific areas where cPAHs had been the driver.

- Will new research on bioaccumulative and synergistic impacts on human health and the ecosystem be incorporated?

3.2 Draft Response

Although the change applies specifically, to benzo(a)pyrene, the carcinogenicity of other PAHs is assessed relative to benzo(a)pyrene through application of a toxicity equivalence factor (TEF). As described in Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part A) (EPA, 1989), PAHs are one of those groups of chemicals [e.g., chlorinated dioxins/furans, polychlorinated biphenyls (PCBs), and PAHs] that are assessed in groups, rather than individually; this approach requires that carcinogenic PAH concentrations be normalized to benzo(a)pyrene. As a result, IRIS's updated Toxicological Review of benzo(a)pyrene applies not only to benzo(a)pyrene, but also all 7 carcinogenic PAHs as a mixture. As noted in the Toxicological Review of Benzo[a]pyrene (EPA 2017), "The oral slope factor for benzo[a]pyrene is derived with the intention that it will be paired with EPA's relative potency factors for the assessment of the carcinogenicity of PAH mixtures."

Additionally, the remedial action objectives (RAOs) were developed to address human health and ecological risks posed by all contaminants of concern at the Site, which includes PAHs, PCBs, dioxins/furans, metals, and other organic chemicals. There is considerable uncertainty in how to combine risk estimates across different chemicals when these substances occur together at the Site, and individuals are typically exposed to mixtures of chemicals. Predictions of how these mixtures of chemicals will interact must be based on an understanding of the mechanisms of such

interactions. Individual chemicals may interact chemically in the body, yielding a new toxic component or causing different effects at different target organs. Suitable data are not currently available to rigorously characterize the effects of chemical mixtures. In the absence of definitive information about synergistic or antagonistic effects, the Portland Harbor human health risk assessment assumes risks are additive consistent with EPA guidance (1989). This approach to assessing risk associated with mixtures of chemicals assumes there are no synergistic or antagonistic interactions among the chemicals and all chemicals have the same toxic endpoint and mechanisms of action. Therefore, the combined effects of contaminants were evaluated to determine the potential cancer and non-cancer risks to human health and potential ecological risks.

In addition, to address some of the uncertainty, conservative exposure assumptions were used to estimate cancer risks and chronic non-cancer hazards. That is, methods and parameters that are much more likely to overestimate than underestimate possible health risks were utilized consistent with EPA risk assessment guidance. For example, individuals were assumed to be exposed to contaminants consistently over many years (for a reasonable maximum exposure, 30 years was used, which represents approximately the 95th percentile of the length of continuous residence in a single location in the U.S. population (EPA 1997)) to maximize estimates of possible exposure.

The change in the total PAH RAL does not change the RALs for the other focused chemicals of concern. If any of the other focused contaminants of concern (such as PCBs, dioxins/furans, and DDx,) exceed their respective RALs in the areas estimated to not exceed the new total PAH RAL, those areas will be addressed through active remediation. The Selected Remedy is expected to be protective of human health and the environment due to risks posed by all the contaminants present at the Site in all environmental media.

With respect to the comments concerning the GASCO site, although there is non-aqueous phase liquid (NAPL) and higher PAH concentrations in this area, the data do not indicate that the PAHs in this area have synergistically higher toxicity. Although the presence of a NAPL makes the characterization and clean-up of contamination in this area more complex due to the physical properties and dispersal of the NAPL and although NAPL has a greater potential for migration to areas where exposure may occur, the Portland Harbor ROD requires all NAPL to be addressed regardless of concentration. This requirement to remediate NAPL is unaffected by the ESD.

4.0 Metabolites Were Not Evaluated

4.1 Comments

Twenty-five commenters believe that breakdown products of BaPs have not been adequately studied and may present an unacceptable risk.

- Comment 2.2. What tests have been done on break down chemicals (metabolites) from PAHs? OSU scientists say some are more toxic than the original chemical.
- Comment 1064.6. Breakdown byproducts of BaP and the other PAHs to be changed can be more toxic than the original chemical according to OSU studies. The ESD has not studied break down byproducts and cannot give assurance that they would be safe. EPA should

error on the side of caution and consider toxicity levels higher than the original chemical when doing cleanup. The original ROD clean up requirements of PAHs should be implemented.

- Comments 47, 49, 62, 92, 94, 96, 453, 457, 494, 496, 498, 601, 1127.6 to 1132.6. Breakdown by-products can be more toxic than the original pollutant. EPA has not studied break down byproducts and cannot give assurance that they would be safe.
- Comment 501. I want to see less concentrated chemicals in north Portland Willamette River. I want to make sure that beaches are safe to swim in. I want EPA to study byproduct breakdown effects and I want to assure that wildlife is not harmed.
- Comment 503. Please protect our precious Willamette River and its wild inhabitants. Breakdown products can be more toxic than the original pollutant. Leaving the chemical in river sediments where the chain of life begins harms all life.
- Comment 605. 14. Metabolites. PAH and PAH breakdown product (metabolite) toxicity are incompletely captured in the default IRIS cancer slopes for benzo(a)pyrene alone. For PAHs it's the metabolites that are a larger human health concern.

Technical comments from parties that provided long format documents pertaining to the topic were received from the Yakama Nation and (b) (6) and addressed the same concerns as the comments listed above.

4.2 Draft Response

The IRIS assessment of carcinogenic effects associated with benzo(a)pyrene considered the extent that carcinogenic PAHs are metabolized to more toxic forms in the body. Thus, the evaluation of toxicity for benzo(a)pyrene considers both the parent compound and the metabolite that actually exerts the toxic effect.

According to the ATSDR toxicological profile for PAHs (1995) , "The mechanism of action of most PAHs involves covalent binding to DNA by PAH metabolites. The bay region diol epoxide intermediates of PAHs are currently considered to be the ultimate carcinogen for alternant PAHs. Once the reactive bay region epoxide is formed, it may covalently bind to DNA and other cellular macromolecules and presumably initiate mutagenesis and carcinogenesis." In other words, the key to PAH toxicity is the formation of reactive metabolites and the biologically effective dose. Scientists have identified CYP1A1 as the primary cytochrome P-450 isoenzyme that biologically activates benzo(a)pyrene. The carcinogenesis of PAH is believed to occur through the binding of PAH metabolites to DNA. Thus, people with genetic variation in CYP1A1 inducibility may be more susceptible to PAH health risks.

Although PAH metabolites in human urine have been tested, the amount of PAH metabolites in urine has been used only as a measure of exposure. The levels are used comparatively to determine whether the people tested have higher levels than the general population. However, this measure of exposure is not a predictive marker for adverse health effects. Each person metabolizes PAHs at different rates and in different ways. Also, as noted above, genetic

susceptibility also impacts PAH carcinogenesis. Thus, measurement of PAH metabolites in urine is different from evaluating risk to human health.

Although one of the commenters alluded to OSU studies, documentation specific to these studies was not provided. Please refer to Response #18 regarding ecological and wildlife risks for a response addressing the latter portion of Comment #501.

5.0 The Change in Cancer Status Is Not Explained

Six comments were received regarding the cancer status of BaP. They are shown below.

- Comment 2.3. "This regulatory change is upgrading Benzo[a]pyrene's (BaP) status from "probable human carcinogen" to "human carcinogen." Why then is EPA upgrading safe exposure amounts to 7 times the previous exposure?"
- Comment 5.4. "Even though the Cancer Score has changed, BaP remains carcinogenic."
- Comment 12.6 and 423.2. "Benzo[a]pyrene is a carcinogen that has been associated with a number of health risks including cancer, heart disease, respiratory problems, and reproductive issues in addition to many more problems."
- Comment 2.6. "Since BaP is used as a toxicity measure for other carcinogenic PAHs, they also, will now also be considered safe at 7x the exposure. This supposes the other chemicals are less toxic. Some are more toxic, according to OSU research. Will BaP be removed as a measure for the safe exposure to other carcinogenic PAHs?"
- Comment 603. "It is unacceptable that the other carcinogenic PAHs measured against BaP would also be considered 7 times less toxic when it's not clear they are less toxic than BaP."

EPA Response

The toxicological assessment of benzo(a)pyrene has two components. One component considers the carcinogenicity (i.e., toxicity) of benzo(a)pyrene. The second considers the likelihood that benzo(a)pyrene is a human carcinogen. Recent toxicological studies have been conducted that are more definitive on the likelihood that benzo(a)pyrene is a human carcinogen, causing the likelihood of benzo(a)pyrene to be a human carcinogen to change from "probable human carcinogen" to "human carcinogen". In addition, recent studies have further refined the toxicity (the extent to which a chemical can cause adverse health effects) of benzo(a)pyrene, resulting in a decrease in the toxicity value. Thus, while the likelihood that benzo(a)pyrene is a human carcinogen has increased, the carcinogenicity of benzo(a)pyrene has decreased.

The evaluation of carcinogenic PAHs is also affected by the change in carcinogenicity of benzo(a)pyrene and are also considered less toxic. As noted above, PAHs are one of those groups of that are assessed in groups, rather than individually. This approach requires that toxicity of carcinogenic PAH concentrations be normalized to benzo(a)pyrene through application of a toxicity equivalence factor. As a result, the change applies not only to benzo(a)pyrene, but also all 7 carcinogenic PAHs as a mixture.

6.0 Skin Contact Exposures Were Not Addressed

6.1 Comments

Twenty-six comments indicated that the ESD provided no information that all activities such as swimming, boating, recreation, and fishing, should be considered in interpreting the change, not just dock work. There is a concern that dermal exposure during swimming is not addressed in the Explanation of Significant Differences.

- Comment 2.4. The update does not include information on skin contact exposure safety limits. Why not? There are 2 swimming beaches on the lower Willamette at Cath & Kelley Pt Parks. Swimming safety is an important issue here.
- Comments 47, 49, 62, 92, 94, 96, 453, 457, 494, 496, 497, 498, 601, 630, 654, 1127, 1128, 1129, 1130, 1131, 1132. There is no information on skin contact even though Cathedral and Kelley Point beaches are affected by a hotspot. There is no assurance that beaches or swimming would be safe.
- Comments 47, 49, 62, 92, 94, 96, 453, 457, 494, 497, 498, 501, 601, 630, and 1071. All activities such as swimming, boating, recreation, and fishing, should be considered in interpreting the change, not just dock work.
- Comments 1127, 1128, 1129, 1130, 1131, and 1132. Safety of all activities such as swimming, boating, recreation, and fishing, should be considered in interpreting the change, not just dock work.

Technical comments from parties that provided long format documents pertaining to the topic were received from the Portland Harbor Community Advisory Group and the Yakama Nation. Their comments address the same concerns as the public comments listed above with additional concerns summarized below:

- Please explain which CSF was used to calculate risks for direct contact in the re-evaluated components of the Portland Harbor human health risk assessment since the IRIS update does not have a dermal CSF. We are concerned that the ingestion CSF was inappropriately applied to the dermal portion of this human health risk assessment.
- While IRIS classified BaP as a carcinogen to humans by all routes of exposures, it did not quantify the risk of skin cancer from dermal exposures, even though the draft assessment had done so.

6.2 Draft Response

The human health risk assessment evaluated exposure to surface water and sediment while swimming at recreational beaches within Portland Harbor. Swimming was included under the category of recreational activities, which included boating, water skiing, occasional swimming, and other waterfront recreation activities. Direct contact with surface water was also evaluated for transients and commercial divers. The evaluation of exposure to sediment considered both dermal (direct skin contact) and oral (incidental ingestion) exposures. In-water sediment exposures were evaluated for recreational, tribal, and subsistence fishers and commercial divers. Recreational users were evaluated for exposure to beach sediment. The risks from exposure to

surface water are summarized in Table 5-57 of the Baseline Human Health Risk Analysis (BHHRA) in Appendix F of the Portland Harbor RI/FS. The risks from exposure to in-water sediment are summarized in Table 5-43, and the risks from exposure to beach sediment are summarized in Table 5-18. As noted in the table footnotes, dashes were inserted when the risk for an exposure area was less than 1 x 10-6.

Consistent with the Portland Harbor baseline human health risk assessment included in the Final Remedial Investigation Report (RI Report – EPA 2016a), the revised CSF was applied for both oral and dermal exposures in the calculations conducted for the ESD. Same as the original evaluation (summarized in Table 5-49 in the BHHRA), the revised evaluation determined that recreational exposure to surface water did not pose an unacceptable risk to recreational swimmers. This revised evaluation of recreational, tribal, and subsistence fishers also considered boating and fishing exposures including dermal (direct skin contact) with sediment. Overall, the greatest risk to human health associated with exposure to cPAHs was due to shellfish consumption.

In the revised evaluation, the Reasonable Maximum Exposure (RME) Hazard Index (HI) for recreational beach sediment exposure was estimated to be 14-17 million times lower than the non-cancer health effect limit for recreational exposure to surface water. These calculations are presented in Appendix A of the ESD. Long-term monitoring will be performed to verify that the Selected Remedy is protective of recreational beach exposure. Please refer to Response #10 for additional discussion on non-cancer risks.

7.0 ESD Was a Departure from ROD methodology

7.1 Comments

Technical comments from parties that provided long format documents pertaining to the topic were received from: NW Natural, Yakama Nation, Earthjustice, Port of Portland, and Miller Nash Graham. The comments note that the process used to establish remedial action levels (RALs) in the ESD is fundamentally different than the process used in the Portland Harbor ROD and Feasibility Study (FS). The comments noted that that EPA evaluated overall protectiveness through a comparison to "interim targets" to be met at completion of construction of active remedies in the Portland Harbor Feasibility Study (FS) and ROD and that EPA expected final cleanup levels to be achieved through monitored natural recovery.

The comments concluded that selection of active remediation areas to achieve final cleanup levels at construction completion is a fundamental change to the selected remedy because in the ROD an alternative was considered effective in the FS if interim targets were met. Large areas that already meet interim risk targets set for RAO 1 in the ROD will require active remediation, including some areas where EPA's calculations show that no actual cPAH risk is present at the updated cleanup level.

Another comment stated that the EPA did not address criticism previously raised regarding adjusting the RALs based on a direct relationship with CULs. In addition, averaging of contamination across the site lessens the impact of contamination at hotspots like Gasco and Terminal 4, which should each be treated individually as Superfund sites. In particular, with the ESD changes, the risks around Gasco could increase twofold which could impact the total remedy

because the Gasco area is not conducive to natural recovery and it is susceptible to scouring which could cause the contamination to migrate.

With respect to RAO 1 (human health direct contact), the comments noted that EPA chose to evaluate protectiveness against an interim target of 1 x 10-5 cumulative post-construction risk. EPA then selected active remedies, delineated through the application of PAH and other RALs, that met this interim target and selected MNR to attain final cleanup levels. The ESD instead selects areas for active remediation of nearshore petroleum contamination by "achieving the updated direct contact cPAH CUL of 774 µg/kg as measured on one-half rolling river mile [surface area weighted average concentrations (SWACs)] throughout the Site" at "100% of the nearshore half-river miles" at the completion of construction. This is a fundamentally different remedy than selected in the ROD, because it entirely eliminates MNR as a component of RAO 1 cPAH remedies (and only cPAH remedies).

Similarly, for RAO 5, EPA established an interim target for RAO 5 of addressing 50% of the area of the site exceeding 10 times the cleanup level at the end of construction and notes that simple math shows that any PAH RAL below 230,000 µg/kg will address all areas exceeding 10 times the PAH cleanup level at construction completion. The comments question why it abandoned its decision in the ROD to evaluate protection of the benthic community using an order of magnitude greater than the 23,000 µg/kg PRG "based on the conservativeness of the sediment quality values used in the [baseline ecological risk assessment] models" and its decision to set the interim target at 50 percent reduction of the area posing benthic risk "because protection of the benthic community is based on a population rather than individual effects, and is considered a target to which the benthic population as a whole can be stressed and still recover. Finally, the comments note that EPA does not provide sufficient justification for its apparent rejection of its "further risk management decisions that the entire area above the RAO 5 PRGs did not need to be addressed through capping and dredging. Since benthic effects from contaminated sediment are due to reproduction and growth, not just survival, this approach would also ensure that the entire population was not diminished through active remediation (capping and dredging is assumed to kill benthic organisms where it occurs)." This is a fundamental change in the ROD in that it eliminates monitored natural recovery as a component of RAO 5 remedies.

The comments state that these deviations from the remedial approach presented in the ROD is inconsistent with the NCP and arbitrary and capricious and that EPA has not explained why it is proposing response actions for petroleum contamination that are far more aggressive than for any other hazardous substance present at the Site and has not provided any analysis of whether those actions are cost-effective or even necessary.

7.2 Draft Response

As described in the ESD, the ESD documents changes to the sediment cleanup levels (CULs) and target tissue level for shellfish for carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and documents a change to the remedial action level (RAL) for total polycyclic aromatic hydrocarbons (PAHs) for areas of the Site outside of the Navigation Channel. The category of total PAHs includes both cPAHs and non-carcinogenic PAHs. The cPAHs are used to evaluate the carcinogenic portion of the total PAHs and is measured as benzo(a)pyrene equivalents (BaPeq).

EPA considered the effect of increasing the nearshore RAL for total PAHs on the ability of the remedy to achieve each RAO established for the site, considering all other COCs co-located with total PAHs. Unacceptable risk at this Site, and in particular, at the SMAs where total PAH RALs may have been the driving contaminant for active cleanup is not only presented by four focused COCs (polychlorinated biphenyls (PCBs), PAHs, dioxins and furans, and DDx, which collectively represents dichlorodiphenyltrichloroethane (DDT) and its primary breakdown products dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE)). The four focused COCs were used to set RALs primarily based on RI data that showed that these four contaminant categories were the most ubiquitous and widespread; thus, focusing the FS analysis and nine criteria comparison evaluation of remedial alternatives for the site on reducing concentrations of these four focused COCs would take care of the risk of the other identified COCs and achieve RAOs for all COCs. Given the use of these four focused COCs to address unacceptable risk presented by co-located contaminants, EPA evaluated the effect on achieving all of the RAOs if the RALs for total PAHs were changed. The evaluation for the ESD demonstrates that the reduction in remedial footprint with an increased nearshore RAL, slightly increases the post-construction risk for all RAOs as summarized below:

- RAO 1: A slight increase in post construction risk was observed. For example, At RM 6.5 West, post-construction direct contact human health risks are estimated to increase 156% from 6 x 10-7 to 1 x 10-6, whereas at RM 4.5 East, post-construction risks are estimated to increase 46% from 2 x 10-6 to 3 x 10-6 (ESD Table 2). However, the revised risk estimates of 1 x 10-6 (RM 6.5 West) and 3 x 10-6 (RM 4.5 East) are within the range of post-construction cancer risks estimated for the evaluated river miles without the RAL change (on the West, 4 x 10-7 to 5 x 10 6; and on the East, 6 x 10-7 to 5 x 10-6). These revised risk estimates are also at the lower end of the range of post-construction cancer risks estimated for the evaluated river miles with the RAL change (on the West, 7 x 10-7 to 5 x 10 6; and on the East, 6 x 10-7 to 5 x 10-6).

- RAO 2: A slight increase in post construction risk was observed. For example, At RM 6.5 West, post-construction risks are estimated to increase 93% from 2 x 10-5 to 4 x 10-5, whereas at RM 4.5 East, post-construction risks are estimated to increase 27% from 8 x 10-5 to 1 x 10-4 (ESD Table 3). Similar to the increases for RAO 1, the revised risk estimates of 4 x 10-5 (RM 6.5 West) and 1 x 10-4 (RM 4.5 East) are within the range of post-construction cancer risks estimated for the evaluated river miles without the RAL change (on the West, 3 x 10-5 to 2 x 10 4; and on the East, 7 x 10-5 to 2 x 10-4). These revised risk estimates are also within the range of post-construction cancer risks estimated for the evaluated river miles with the RAL change (on the West, 4 x 10-5 to 2 x 10 4; and on the East, 7 x 10-5 to 2 x 10-4). Post-construction non-cancer hazard indices quotients also increase. The largest estimated hazard index increases are from 0.8 to 1.7 for a child and from 25 to 48 for an infant at RM 6.5 (ESD Table 3). The increase of these non-cancer hazard indices is based on the change in remedial footprint and are not attributable to the non-cancer oral RfD for benzo(a)pyrene. Although the change in remedial footprint results in an increase in non-cancer hazard indices from COCs (other than cPAHs), the updated non-cancer hazards were comparable to the previously calculated non-cancer hazards, such that the Selected Remedy with the ESD was determined to be protective of human health and the environment.

- RAO 5: Revising the Site Wide total PAH RAL to 30,000 µg/kg will reduce the percentage of the Site achieving 10 times the benthic risk CULs from 72% to 69% of the Site following construction (ESD Table 4). Since the ROD goal is to protect 50% of the benthic risk area defined by 10 times benthic PRGs, the benthic risk reduction goal established in the ROD is achieved regardless of the TPAH RAL adjustment. The navigation channel RAL was kept at 170,000 µg/kg because it may affect the ability of the Selected Remedy to achieve the total PAH CUL of 23,000 µg/kg for protection of the benthic community, especially within the navigation channel between RM 5 and RM 7.

- RAO 6: Revising the total PAH RAL will slightly increase risks to fish and wildlife through prey consumption. For example, the total hazard index increased from 1.2 to 1.5 for both SDU 4.5 East and SDU 6 West (ESD Table 5). While this is an increase, it is within potential calculation variances and does not change the significance of the result, which is the hazard index is only slightly greater than 1. In addition, PAHs were not identified in the Record of Decision (ROD) as a COC for ecological receptors that consume prey at the site. Thus, the conclusion in the ROD remains the same that wildlife will be able to safely consume prey from within the Site immediately after construction of the Selected Remedy, since all non-cancer risks on a Site-wide scale will be addressed.

- RAOs 3 and 7: A slight increase in risk was observed. For example, reductions in cPAH surface water concentrations were estimated as 78% for the Selected Remedy. Based on the changes to the Selected Remedy, the reduction in cPAH surface water concentrations is estimated as 77% (ESD Table 6). This also was a reason for which the navigation channel RAL was not proposed for change.

- RAOs 4 and 8: The area of groundwater plumes addressed by the in-water portion of the updated remedy following construction is estimated to be reduced from 39% to 32% (ESD Table 7). The remainder of the contaminated groundwater will be dependent on the adequacy of source control actions.

Although a slight increase in cancer risks is estimated for all RAOs, it is estimated that human health and ecological RAOs for surface water will be achieved through active remediation of sediment and source control from upland sources and upstream sources to surface water.

With respect to RAO 1 (human health direct contact), the ESD notes that risk estimates for receptors in the beach areas based on the updated BaP CSF change are within EPA's risk range of 10-6 to 10-4 and do not need to be addressed through active remediation. In addition, it is expected that risks to human health in beach areas will be further reduced through natural recovery processes. Thus, this exposure pathway was not considered a determining factor for the total PAH RAL.

Commented [A1]: Need to check for consistency with RBG. "are not expected to be . . . " MNR?

The ESD further considered human health direct contact with in-water sediment. Updating the direct contact cPAH sediment CUL from 106 µg/kg to 774 µg/kg without adjustment of the nearshore total PAH RAL would have resulted in the remediation of some sediments that do not exceed 774 µg/kg as measured on a one-half rolling river mile SWAC basis. Thus, EPA conducted an evaluation consistent with the direct contact residual risk evaluation presented in Appendix IV of the Portland Harbor ROD and determined that increasing the total PAH RAL for the Selected

Remedy to 30,000 µg/kg will protect 100% of the nearshore half-river mile by achieving the updated direct contact cPAH CUL of 774 µg/kg as measured on one-half rolling river mile SWACs throughout the Site. EPA determined that modifying the remedial footprint in this manner will maintain the protectiveness of the Selected Remedy for RAO 1, while reducing the estimated cost of the Selected Remedy.

Some comments criticize that the ESD evaluation eliminates MNR as a component of RAO 1 and RAO 5 remedies because it no longer considers the interim targets for risks that were used in the FS and ROD. As stated in the Responsiveness Summary to the ROD, interim targets for risks and HIs were developed for feasibility study purposes because a long-term model is not available to predict the time to meet the PRGs. The interim targets were used to evaluate each alternative's effectiveness in achieving cleanup goals in a reasonable time frame among other matrices. The interim targets were not intended to be a ceiling for how much risk reduction construction could or would achieve. The environmental processes that support natural recovery are present in the river (incoming sediment loads promoting burial and dilution, contaminant declines through dispersion, and degradation of some compounds) and will be hastened when in-river and upland sources of contamination are reduced. However, the complex nature of the Site and the limited data set to demonstrate the rate of improvement in water, sediment, and fish tissue contaminant concentrations restrict the ability to make quantitative determinations of contaminant declines following remediation based on empirical analyses or mechanistic modeling. Therefore, estimates of the post-remediation condition were used in the FS and ROD to gauge environmental improvement from remedial action. Although the ESD did not evaluate risk against the interim targets presented in the FS and ROD, the ESD considered potential interim (post-construction) and long-term impacts regarding whether remaining risks could be achieved through monitored natural recovery. However, EPA has determined that the effectiveness of MNR is uncertain within the navigation channel between RM 5 and RM 7 based on the following:

- A multiple line of evidence evaluation in the ESD of natural recovery processes at the Site determined that the navigation channel between RM 5 and RM 7 is generally not conducive to natural recovery. As a result, EPA determined that increasing the navigation channel RAL above 170,000 µg/kg may limit the ability of the remedy to achieve the total PAH CUL of 23,000 µg/kg for protection of the benthic community (RAO 5) over time.
- As noted in the comment, the ROD found that natural recovery was less certain in RM 6 – 8. This conclusion supports EPA's determination that the total PAH RAL should not be revised upward in the Navigation Channel.
- In addition, EPA has reviewed the recently collected sediment data collected from the navigation channel. As noted in the comment, the bathymetric survey shows between 7.5 cm to greater than 30 cm of erosion throughout a significant portion of navigation channel between RM 5 and 7. This information further supports EPA's decision not to adjust the navigation channel total PAH RAL from 170,000 µg/kg.

These evaluations demonstrate that MNR may not be effective on its own in the navigation channel between RM 5 and RM 7 where PAHs are present at concentrations that pose a risk to the benthic community. Hence, due to the lack of natural recovery processes increasing the total PAH

navigation channel RAL above 170,000 µg/kg may result in a reduction in the ability of the Selected Remedy to attain RAO 5.

9.0 The Relationship of New BaP Levels to Background is Unclear

9.1 Comments

- Comment 2.7. How do the new BaP risk levels relate to background BaP/PAH levels?

9.2 Draft Response

The background concentrations of total PAHs and carcinogenic PAHs outside of the CERCLA study area were estimated in the Portland Harbor Feasibility Study (FS) as 113 µg/kg (Table 7.3.1 in the RI) and 12 µg/kg (Table H1-2 in the FS) respectively. For carcinogenic PAHs, the direct contact sediment exposure pathway was shown to present the greatest risk to human health. The direct contact human health risk associated with exposure to carcinogenic PAHs in nearshore sediments at background concentrations is approximately 2 x 10-8, which is within acceptable risk. The direct contact human health associated with exposure to carcinogenic PAHs in beach sediments exposures at background concentrations is approximately 1 x 10-7 also within acceptable risk levels.

Although concentrations detected at the Portland Harbor site are higher than background levels, the HHRA determined that total PAHs at the Portland Harbor site did not pose a non-cancer risk to human health.

10.0 Non-Cancer Risks Were Not Addressed

10.1 Comments

Comments express concern that the ESD did not adequately assess non-cancer human health risks. The comments also request a comparison of cleanup levels based on cancer risk with cleanup levels based on non-cancer risk.

- Comment 5.5. Other health effects are not addressed, such as damage to the nervous system, immune system, and reproductive system.
- Comment 27.2. The studies EPA sites for this claim only account for cancer risk, and ignore other health risks associated with this chemical (listed above) that are well documented.
- Comment 605. The failure to include direct contact non cancerous human health risks is simply not acceptable. Oregon DEQ has recently developed non cancerous human health risks and these standards should be included before Oregon DEQ issues a concurrence letter.
- Comment 663. OHA recommends the ESD include a comparison between CULs calculated using the updated CSF based on cancer risk and CULs calculated using the new RfD for BaP based on non-cancer risk in section 3.1 of the ESD. These comparisons should be made for each exposure scenario in remedial action objectives 1 and 2 and should be further summarized in a new table following table 1 of the current ESD. OHA has received questions from the public about the non-cancer risks associated with benzo(a)pyrene in the context of the Portland Harbor Superfund Site cleanup. Oregon relies upon the

authoritative work of EPA's science program to assess and communicate to the public about health risks to humans from environmental exposures. The development of an oral reference dose for noncancer risks of benzo(a)pyrene is a valuable contribution to this work and is as important as the update to the oral cancer slope factor for cancer risk from this chemical. In the context of the strong community interest in the Portland Harbor cleanup, it is vital to have public confidence that all relevant risks that can be evaluated are reflected in EPA's analysis.

Technical comments from parties that provided long format documents pertaining to the topic were received from: Portland Harbor Community Advisory Group, Earthjustice, and (b) (6). The detailed comments address the same concerns as the public comments listed above with additional concerns summarized below:

- The ESD would increase non-cancer health risks. It does not address non-cancer issues such as endocrine disrupters which affects the reproductive system and therefore future generations. In addition to cancer, BaP is linked to neurological, developmental, reproductive, and immune toxicity in people.
- EPA assessed the risks of health effects other than cancer using a different, standard methodology. EPA compared the average daily exposure to its safe level, called a reference dose. EPA derives a hazard quotient, which is the ratio of the exposure to the reference dose.
- The ESD projects that noncancer risks would increase by substantial percentages for children and infants. For example, the hazard index for a child would increase from 0.8 to 1.7, turning what was not a risk of concern to one that is now of concern. The hazard index for an infant at river mile 6.5 would increase from 25 to 48, a 91% increase (Table 3).
- Given EPA's mandate to protect public health, it cannot justify the increases in health risks to children at river miles 5.5 to 6.5 by 24%, 43%, and 100%, or to infants by 23%, 38%, and 91%.

10.2 Draft Response

The "other health effects" in the comments refer to the effects other than cancer that were identified in the Toxicological Review of Benzo(a)pyrene (EPA 2017a). This report provided organ and system-specific reference doses (RfDs) related to developmental, reproductive and immunological effects associated with exposure to benzo(a)pyrene, and provided an overall non-cancer oral RfD of 0.0003 mg/kg-day for benzo(a)pyrene. This non-cancer oral RfD value for benzo(a)pyrene was previously known and was used in the human health risk assessment for Portland Harbor. Thus, this value was used to develop preliminary remedial goals (PRGs) expressed as a chemical concentration in various media for the Portland Harbor FS (see Table B3-2 of the FS). Therefore, non-cancer risks based on current science for benzo(a)pyrene was considered in the development of cleanup levels for benzo(a)pyrene presented in the Portland Harbor Record of Decision (ROD). As presented in Table B3-4 of the Portland Harbor FS, PRGs calculated for non-cancer risk are significantly higher than the PRGs calculated for cancer risk (and remain so even with new IRIS cancer slope factor); and thus, the PRGs calculated for non-

cancer risk are not a factor for establishing the CUL for benzo(a)pyrene at the Portland Harbor Site in Table 17 in Appendix II of the Portland Harbor ROD.

With regard to the OHA comment, ESD Table 1 already includes a comparison between the ROD CUL and the CUL calculated using the updated CSF based on cancer risk. As noted above, PRGs calculated for non-cancer risk are significantly higher than the PRGs calculated for cancer risk; and thus, the PRGs calculated for non-cancer risk are not a factor for establishing the CUL for benzo(a)pyrene at the Portland Harbor Site. To confirm that benzo(a)pyrene did not pose unacceptable non-cancer hazards at the Portland Harbor site, Appendix A17 of the ESD presents the results of additional calculations for non-cancer hazards associated with the child recreational beach sediment and in-water tribal fisher direct contact in-water sediment exposure scenarios. The recreational and subsistence clam consumption exposure scenarios (remedial action objectives 1 and 2) were evaluated consistent with the Portland Harbor baseline human health risk assessment and standard methodology in EPA guidance (1989). These exposure scenarios were selected because they represent the greatest potential benzo(a)pyrene exposure (based on a review of the values in Tables B3-4 and B3-5 of the Portland Harbor FS). Although the non-cancer hazard quotients should be the same because the benzo(a)pyrene RfD has not changed since completion of the Portland Harbor FS, the PRG based on HQ for RAO1 for the child recreational beach receptor is not presented in Table B3-4 in the FS (it is reported as "NA" in the table). The results of the evaluation, presented in Appendix A17 of the ESD, determined that the maximum direct contact beach and in-water sediment hazard quotients were 0.03 and 0.06, respectively, and that the maximum recreational and subsistence clam consumption exposure hazard quotients were 0.08 and 0.4, respectively. These results demonstrate that there are no unacceptable non-cancer risks associated with benzo(a)pyrene at the site.

Non-cancer benzo(a)pyrene sediment PRGs were also calculated for the same scenarios evaluated in the RI and are presented in Appendix A17 of the ESD. It was determined that non-cancer benzo(a)pyrene beach sediment PRGs range from 12,470 to 536,389 µg/kg and non-cancer benzo(a)pyrene in-water sediment PRGs range from 231,731 to 10,365,812 µg/kg. These PRGs are well above the cleanup levels for carcinogenic PAHs, as identified in Table 1 of the ESD, which are 85 µg/kg for beach sediment and 774 µg/kg for in-water sediment outside the navigation channel. Similarly, non-cancer benzo(a)pyrene sediment PRGs for the human health clam consumption exposure scenario were also calculated and it was determined that non-cancer benzo(a)pyrene clam consumption sediment PRGs range from 208,643 µg/kg to 3,526,4222 µg/kg. These PRGs are also well above the clam consumption cleanup level for carcinogenic PAHs of 1,076 µg/kg, as identified in Table 1 of the ESD for navigation channel sediment.

The increases in hazard indices mentioned in the comments (the hazard index for a child from 0.8 to 1.7, and hazard index for an infant from 25 to 48) are in reference to the total non-cancer risk (child) hazard indices presented in Table 3 of the ESD. The increase of these non-cancer hazard indices is based on the change in remedial footprint and are not attributable to the non-cancer oral RfD for benzo(a)pyrene. These hazard indices are the sum of hazard quotients from 2,3,7,8-tetrachlorodibenzofuran (TCDF), tetrachlorodibenzo-p-dioxin (TCDD), 2,3,4,7,8-pentachlorodibenzofuran (PeCDF), 1,2,3,7,8-pentachlorodibenzo-p-dioxin (PeCDD), 1,2,3,4,7,8-hexachlorodibenzofuran (HxCDF), polychlorinated biphenyl (PCB), dieldrin, DDx (the sum of dichlorodiphenyltrichloroethane (DDT) and its primary breakdown products

dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE)), chlordanes, and aldrin, which are the primary contributors to the non-cancer hazards at Portland Harbor. The hazard indices have been calculated and are presented on a ½ rolling river mile basis in the ESD. As noted above, hazards from the cPAH non-cancer endpoints were not the driving factor in the cleanup; the evaluation determined that cancer risks for cPAHs continue to be a driving factor in the cleanup, and the cPAH CUL was based on achieving a 1 x 10-6 cancer risk level. Although the change in remedial footprint results in an increase in non-cancer hazard indices from COCs (other than cPAHs), the updated non-cancer hazards were comparable to the previously calculated non-cancer hazards, such that the Selected Remedy with the ESD was determined to be protective of human health and the environment.

12.0 New Application of Nearshore RALs to Beaches

12.1 Comment

Technical comments were received from the Yakama Nation who believe that the ESD appears to provide a new ROD interpretation that nearshore sediment RALs apply to beaches. Additional clarity must be provided in the ESD on how beaches will be evaluated.

12.2 Draft Response

As described in the ESD, the Portland Harbor baseline human health risk assessment evaluated a range of direct contact exposure scenarios for beach sediment and in-water sediment. The Portland Harbor FS developed preliminary remediation goals (PRGs) for carcinogenic PAHs (cPAHs) of 12 µg/kg based on a recreational beach exposure scenario and 106 µg/kg based on a tribal fisher exposure scenario. Although the Portland Harbor ROD selected a cPAH sediment cleanup level (CUL) of 12 µg/kg for nearshore sediments based on a recreational beach exposure scenario, post construction residual risk estimates presented in Appendix J of the FS and in Appendix IV of the ROD were based on the tribal fisher direct contact exposure scenario. Increasing the beach sediment PRG of 12 µg/kg by a factor of 7.3 results in a revised beach sediment PRG and CUL of 85 µg/kg. Increasing the tribal fisher direct contact sediment PRG of 106 µg/kg by a factor of 7.3 results in a revised tribal fisher direct contact sediment PRG and CUL of 774 µg/kg.

As further noted in the ESD, EPA re-evaluated application of the nearshore sediment CUL based on the recreational beach exposure scenario and determined that two cPAH direct contact CULs should apply to nearshore sediments. An updated direct contact beach cPAH CUL of 85 µg/kg has been applied to recreational beaches based on existing (based on 94 days of exposure, refer to final human health risk assessment) or reasonably anticipated future use while the updated cPAH direct contact CUL of 774 µg/kg based on the tribal fisher exposure scenario will apply to all other nearshore sediments. The direct contact exposure scenario is not considered complete within the navigation channel. EPA has determined that two direct contact cPAH CULs is consistent with the exposures evaluated in the Portland Harbor human health risk assessment and more accurately represents potential sediment exposure at the Portland Harbor Site.

13.0 The Remedy Change is to Save The PRPs Money

13.1 Comments

The public comments express concern that the $35 million cleanup cost reduction associated with the implementation of changes described in the ESD is driving the changes to the Selected Remedy, and such cost reduction will result in inadequate cleanup of the Site.

- Comment 2.8. How much money does this change save Gasco, the most polluted site on the lower Willamette? How much does is save Port of Portland on the T4 cleanup? and other PRPs?
- Comment 6.2. I can't help but wonder who funded the research and which businesses will benefit from the $35 million savings. It's not just a matter of reducing the risk to an acceptable level determined by a scientific study aimed to reduce the cost of clean-up. All across the US, we have seen the current administration's disregard for protecting our national forests, monuments, and parks in the interest of financial gain. I'm in disbelief that we could dismiss our responsibilities to protect the public's health and properly clean-up the Willamette River in order to save money.
- Comment 7.2. The 'new' plan proposed would not accomplish this greatest purpose, although it might spare potentially responsible parties close to $35 million in shared cleanup costs.
- Comment 12.2, 13.3, 14.2. These proposed changes, or so-called "Explanation of Significant Differences" would shrink the final cleanup plan, letting two of the largest polluters, NW Natural and the Port of Portland, off the hook for about $35 million
- Comment 18.3. Of course, it would be of interest to two of the largest polluters to save $35 million in their share of the cleanup costs. Small wonder they suggest 'significant differeces'; that would be a significant difference to their bottom line.
- Comment 19.4. The harbor cleanup is still overdue, and now it appears that the EPA is shirking from it's responsibilities to protect the environment, on the pretense that cutting corners will save $35 million of a $1 billion project. This is wrong. The Portland harbor is polluted. We need a consistent, unified effort to cleanup our waters.
- Comment 26.4. Please do the right thing, and do not shrink the final cleanup plan, and let NW Natural and the Port of Portland off the hook for $35million!
- Comment 27.4. These proposed changes--the so-called "Explanation of Significant Differences"--would shrink the final cleanup plan, letting two of the largest polluters, NW Natural and the Port of Portland, off the hook for about $35 million. Both of these entities, and other polluters, should be held fully accountable for pollution of the Willamette River.
- Comment 423.4. These proposed changes, or so-called "Explanation of Significant Differences" would shrink the final cleanup plan, letting two of the largest polluters, NW Natural and the Port of Portland, off the hook for about $35 million.

- Group A email (628 of these). This change would only benefit polluters who are responsible for that cleanup cost in the first place, showing a priority for industry profits over public need.

Technical comments from parties that provided long format documents pertaining to the topic were received from the Portland Harbor Community Coalition who expressed concern that changes in BaP toxicity and ESD were prompted by monetary and political influence of PRPs and are not adequately considering the well-being of the Tribes and communities living in the area. Comments also express concerned that the baseline sampling was weakened due to PRP's influence and that the cleanup will not be protective of human health and the environment.

13.2 Draft Response

The ESD changes to the Portland Harbor ROD were a result of the EPA's updated Toxicological Review of Benzo(a)pyrene (BaP) prepared under the Integrated Risk Information System (IRIS) program. Because carcinogenic PAHs are a class of contaminants that drive the cleanup in areas throughout the Portland Harbor site, EPA determined it was appropriate to evaluate how the new toxicity information might affect the Portland Harbor cleanup decision.

Because of the revised reduced toxicity associated with PAHs, which is reflected in the adjusted oral cancer slope factor (CSF), cleanup level concentrations (CULs) were recalculated to reflect the current science regarding acceptable risk levels for human and ecological receptors. Calculated cleanup level concentrations increased due to the decreased BaP CSF value, which reflects updated IRIS information indicating that PAHs are less toxic to human health than was previously considered. The change in CUL concentrations resulted in less area in the site exceeding the nearshore sediment remedial action level (RAL) and also fewer areas exceeding the revised CULs. The cost reduction of $35 million due to the recalculation is an estimate for the differences in the PAH RAL for nearshore sediments outside the navigation channel. It represents a 3.4% reduction in the overall cost estimate for the Selected Remedy, and is an adjustment based on a better understanding of BaP cancer toxicity criteria. It does not aim to benefit a specific responsible or performing party or favor a specific portion of the river, but rather it makes the cleanup consistent with current science and it continues to ensure acceptable human health risks for all the communities living in the area. The cost was not the deciding factor in these evaluations and the reduction in cleanup footprint relied mainly on the updated human health risk information that EPA understands to be a more accurate representation of risks due to PAHs.

14.0 ESD Changes Weaken the ROD

14.1 Comments

There are concerns that the reduction in active cleanup area will lead to weakening of the ROD and leave too much contamination behind.

- Comments 12.1, 13.6, 14.5. Weakening the cleanup would leave more contamination at the site for an indefinite amount of time; The U.S. EPA was already planning to clean up only 13% of the worst contaminants.

- Comment 19.2. Third: The EPA has not demonstrated this weakened cleanup plan would guarantee leaving the water safe for all fish, animals and humans to consume. Unless and

until they can show scientific proof of such assurances, this weakened plan cannot be considered, much less implemented.

- Comment 27.5. The proposed reduction in the cleanup effort would leave more contamination at the site for an indefinite amount of time; even before this proposal, the EPA was already planning to clean up only 13% of the worst contaminants. Moreover, the EPA has not yet determined whether this weakened cleanup would uphold water quality standards to protect people, animals, and the environment from dangerous risks. This is not acceptable. EPA should be doing its utmost to clean up Portland Harbor; I demand that you abandon this attempt to lessen cleanup efforts.

- Comment Group B (289 of these). Leaving these contaminants in the river at the "GasCo site" and "Terminal 4" means that people and wildlife will continue to be at risk of exposure for an indefinite period of time. There is inadequate information about how these contaminants may migrate in our river over time and how they may interact with other toxic contaminants in the river.

Technical comments from parties that provided long format documents pertaining to the topic were received from: Earthjustice, Portland Harbor Community Coalition, Yakama Nation, and (b) (6) . The commenters stated that EPA must adopt a cleanup under CERCLA that is responsive to the public and protective of human health and the environment. The weakening of the cleanup standards and remedial action levels would have palpable effects on the overall effectiveness and protectiveness of the cleanup. Most importantly, it would reduce the amount of active remediation through dredging. It has weakened the triggers for dredging across the Superfund site in a way that will reduce the amount of dredging that will occur at Gasco and Terminal 4.

Commenters expressed concerns regarding application of the updated total PAH RAL and carcinogenic CULs at hotspot areas of the site such as Gasco and Terminal 4. Commenters also suggested that it is not appropriate to adjust (weaken) the RALs based on a direct relationship with CULs. Commenters also requested clarification of the relationship between the navigation RAL and PAH acute toxicity to the benthic community and other receptors. Commentators expressed a concern that the navigation channel will not be able to naturally recover in many areas affected by PAHs, and that many RAOs and CULs applicable to navigational channel are not achievable within the navigation channel. Commentators express concern that some beaches are not included in the proposed remedy and should be (e.g., RM 2-3 East, RM 4-5 West, and RM 5-7 E) due to their proximity to SMAs. Commenters also expressed concern related to achievement of RAOs 1, 4, and 8; the effectiveness of natural recovery; and the use of average river mile-surface concentrations; and how average values are "diluting" the effects of extreme concentrations. An additional concern identified by the commenters is that EPA has not accounted for recontamination when weakening the cleanup standards and that changing the ROD requirements will cause preferred treatment for some responsible parties and ~~would~~ that EPA would not be considering changes to the remedy if the results of updated studies caused CULs and RALs to be more stringent. Commenters also expressed additional concerns regarding fish advisory remaining post the remedial action and ESD worsening the protectiveness of the original Selected Remedy approach. Recommendations were made to address hotspots separately from

low concentrations areas to ensure appropriate remedial efforts are conducted at hotspots, specifically at Gasco which is not conductive to natural recovery and the orientation of the site makes it susceptible to scouring.

There is also a concern that hotspots of contamination are not addressed (Gasco and Terminal 4) properly. EPA appears to have discounted these increased risks by averaging them over the entire site even though the risks from the highly contaminated Gasco and Terminal 4 sites have been the subject of heightened concerns due to high levels of PAH contamination. Cutting corners on dredging of principal threat wastes at these sites would leave dangerous hot spots, as Table 3 reveals.

Shrinking the area that would be dredged at these highly contaminated sites would also lead to the migration of the contaminants that would pose risks to people and the river far into the future. This is a particular concern at the Gasco site because it is subject to scouring, which mobilizes sediments allowing them to move downriver. By using cancer risk level to weaken the standard, EPA is focusing only on the high toxicity of PAHs, but principal threat wastes include contaminants that are highly mobile. EPA needs to consider whether PAHs should still be designated as principal threat wastes based on their high mobility at least at PAH hot spots like Gasco that are subject to scouring.

Lastly, a concern was raised that EPA recommended a weakening of the remedial action levels for the nearshore area and navigation channel based on a proportional adjustment approach and a risk reduction approach.

14.2 Draft Response

CULs for benzo(a)pyrene (BaP) were updated due to modification in the cancer slope factor (CSF) for BaP based on the most recent knowledge of BaP toxicity. The nearshore RAL change for total PAHs was based on an evaluation consistent with the direct contact residual risk evaluation presented in Appendix IV of the Portland Harbor ROD. EPA did not weaken the RAL based on a direct relationship between total PAH RAL and the updated carcinogenic PAH CUL as suggested by the commenters. Rather, EPA evaluated a range of total PAH RAL for the Selected Remedy and determined that total PAH RAL of 30,000 µg/kg will protect 100% of the nearshore half-river mile by achieving the updated direct contact cPAH CUL of 774 µg/kg as measured on one-half rolling river mile SWACs throughout the Site (see ESD Figure 5). Note that the 30,000 µg/kg is less than increasing the previous total PAH RAL for the Selected Remedy of 13,000 µg/kg by a factor of 7.3 to 95,000 µg/kg (the factor of 7.3 represents the magnitude of the change to the BaP CSF). Analysis presented in the ESD demonstrates that remedy still remains protective consistent with the evaluations presented in the Portland Harbor Feasibility Study (FS) and Record of Decision (ROD) relative to EPA's definition of acceptable risk at the end of construction. Please refer to Response #25 for a discussion on the ability of the remedy to achieve the RAOs established for the site considering all COCs and to Response #18 for a discussion on risks to wildlife. As a result, the selected remedy is still protective of human health and the environment.

Although modifications to the selected remedy in the ESD reduced the remedial footprint by 17 acres, EPA analysis demonstrates that this represents a negligible increase in the overall post-construction risk to human health and the environment (See ESD Figures 9a-c and 10a-l).

EPA agrees with the comment that the navigation channel may not be able to naturally recover in many areas affected by PAHs, as a result, EPA did not adjust the total PAH RAL applicable to the navigation channel where MNR has been demonstrated to be less effective. As a result, EPA has concluded that the effectiveness of MNR will not be adversely affected by this ESD change to the nearshore RAL for total PAHs. Similarly, EPA has determined that the ability of the selected remedy (i.e. A higher RAL nearshore and no change to the previous navigation channel RAL for PAHs) to achieve water quality standards over time is also negligible as shown in ESD Table 6. Please refer to Response #7 for additional discussion on MNR.

Regarding the comment that some beaches are not included in the proposed remedy, recreational and non-recreational beaches will be remediated based on application of the total PAH nearshore RAL. Long-term monitoring will be conducted to evaluate the effectiveness of the remedy at achieving the applicable CUL.

Commented [A2]: Beaches addressed via RALs

The risk of recontamination will also be considered during remedial design which will require a determination that sources of contamination have been controlled sufficiently to allow the remedial action to proceed.

Regarding comments about hot spots of PAH contamination at the GASCO and Terminal 4 locations, EPA notes that any reduction in the remedial footprint in these areas only relates to PAH sediment contamination that no longer poses an unacceptable risk to human health based on the BaP CSF. If there are any high concentrations (exceeding RALs) of any other focused COC in such areas, those areas would need to be actively remediated, but existing data does not indicate that such contamination exists. EPA acknowledges that the area offshore of GASCO is subject to periodic erosion and deposition. However, PAH sediment contamination above all RALs and where PTW exists will be remediated to address unacceptable risks to human health in a manner and to a degree that no high-level contamination will remain for ongoing erosion and deposition of sediment contamination offshore of GASCO will occur. Please refer to Response #25 for additional discussion on the calculation of the PAH RAL.

EPA also notes that the presence of non-aqueous phase liquid (NAPL) and not reliably containable (NRC) principle threat waste associated with PAH contamination are unaffected by the ESD. However, the highly toxic PTW threshold for cPAHs of 106,000 µg/kg increases by a factor of 7.3 to 774,000 µg/kg due to the BaP slope factor change. This increase will limit the presence of highly toxic PTW at the Site as identified on proposed ESD Figure 3.

Finally, EPA disagrees that consideration of remedy effectiveness based on a rolling ½ or 1 river mile average surface sediment concentrations has the effect of "diluting" the effects of extreme concentrations. Rather this approach is consistent with the relevant size of exposure units as evaluated in the baseline human health and ecological risk assessments.

15.0 The Science Used is Flawed and Controversial

15.1 Comments

Comments claim benzo(a)pyrene is carcinogenic and seem to conclude that changes to the cancer slope factor (CSF) imply that benzo(a)pyrene will not be removed to the levels that would no longer pose unacceptable risk to human health. The comments also question the research that concluded that BaP is less toxic than was originally considered.

- Comments 12.1, 13.2, and 14.1. Benzo[a]pyrene is a carcinogen that has been associated with a number of health risks including cancer, heart disease, respiratory problems, and reproductive issues in addition to many more problems. The U.S. Environmental Protection Agency (EPA) claims that scientific studies since the Obama years show benzo[a]pyrene is 7 times less toxic than was originally thought, though recent research from other sources may prove contrary to these claims and only accounts for cancer risk.

- Comment 19.2. The EPA's own IRIS database still describes the carcinogen as a health problem: "benzo[a]pyrene is 'carcinogenic to humans' based on strong and consistent evidence in animals and humans". Ingested benzo(a)pyrene still causes mutagens that lead to gastrointestinal tumors in the stomach, esophagus, tongue, and larynx. The science on this has not significantly changed.

- Comment 423. The U.S. Environmental Protection Agency (EPA) claims that scientific studies since the Obama years show benzo[a]pyrene is 7 times less toxic than was originally thought, though recent research from other sources may prove contrary to these claims and only accounts for cancer risk.

- Comment Group A (628 of these). Your plan to reduce cleanup based on a new review of the cancer risk of benzo(a)pyrene does not measure up to the standard that we deserve to protect the river and its users. These findings do not change the fact that benzo(a)pyrene exists in our river and is a known carcinogen, nor does it take into account the threat it poses to other aspects of heart, respiratory, and reproductive health. What your plan does is limit important cleanup efforts based on a scheduled toxicity review of a chemical that was already flagged as dangerous and in need of cleaning.

- Comment 27.1. This pollutant is a carcinogen that has been associated with a number of health risks including cancer, heart disease, respiratory problems, and reproductive issues in addition to many other problems. While the EPA claims that benzo[a]pyrene is less toxic than was originally thought, recent research from other sources may prove contrary to these claims.

Technical comments from parties that provided long format documents pertaining to the topic were received from: Portland Harbor Community Advisory Group, Earthjustice, and Portland Harbor Community Coalition. Technical comments are also concerned with potential implication of updated IRIS review of BaP no longer being a human carcinogen. The comments also express concern with scientific basis for updating the CSF, as well as correlation of cPAHs to benzo(a)pyrene equivalents. The comments address concerns about not encompassing all the available research on correlation between BaP and other cPAHs and potentially using outdated relative potency factor (RPF) values.

15.2 Draft Response

The changes outlined in the ESD are based on sound science and represent a more accurate estimation of the health risks associated with benzo(a)pyrene and other cPAHs. Because benzo(a)pyrene is not as toxic to humans as was perceived when the ROD was issued, changes made still ensure that the cleanup at Portland Harbor is still just as protective for human health. The evaluation of carcinogenic PAHs is also affected by the change in carcinogenicity of

benzo(a)pyrene and are also considered less toxic. PAHs are assessed in groups, rather than individually. This approach requires to have carcinogenic PAH concentrations normalized to benzo(a)pyrene. As a result, the change applies not only to benzo(a)pyrene, but also to all 7 carcinogenic PAHs as a mixture. As noted in the *Toxicological Review of Benzo[a]pyrene* (EPA 2017), "The oral slope factor for benzo[a]pyrene is derived with the intention that it will be paired with EPA's relative potency factors for the assessment of the carcinogenicity of PAH mixtures." In order to address the contaminated hotspots, the Site will be addressed based on RALs for COCs that were spatially identified and to specifically addressed through active remediation to ensure the protectiveness of the of the Selected Remedy across the entire Site.

With regards to the choice of literature included in the IRIS's updated toxicological review of benzo(a)pyrene, the review states "the assessment used systematic literature search and screening approach documented in a table (databases, keywords) and flow diagram (inclusion and exclusion of studies) to increase transparency and clarity". Out of 21,000 references identified for consideration of the toxicological review of benzo(a)pyrene, references were screened based on a variety of factors, including relevance to benzo(a)pyrene toxicity in mammals, site-specific risk assessment, chemical analytical methods, cancer chemotherapy studies, adequate reporting of study methods or results, animal toxicity with mixtures in chemicals, abstracts and duplicates. About 700 references were screened out of 21,000 references based on thorough review and were used in the 2017 toxicological review of benzo(a)pyrene, including several pertinent studies since 2012. It had distinct sections for "literature search and study selection, hazard identification, and dose-response assessment. All references were added to the Health and Environmental Research Online (HERO) database.

Studies were evaluated uniformly for aspects of design, conduct, or reporting that could affect the interpretation of results and contribution to the synthesis of evidence. The evidence was synthesized for each dataset, integrated for each target organ/system, and then integrated across different target organs/systems. The IRIS Program used existing guidelines to systematically approach the integration of human, animal, and mechanistic evidence. For each outcome, the IRIS Program evaluated the consistency of a possible association, the strength of association, the presence of dose-response relationship, whether the exposure preceded the effect, and the biological plausibility of the response and its relevance to humans. For human and animal studies, the evaluation of study methods and quality considered study design, exposure measures, outcome measures, data analysis, selective reporting, and study sensitivity. For human studies, this evaluation also considered selection of participant and reference groups and potential confounding. Emphasis was on discerning bias that could substantively change an effect estimate, considering also the expected direction of the bias".

A great level of effort was used to help ensure unbiased and extensive evaluation of all the relevant studies available. Studies indicated in the appendices of Earthjustice's reports were not included in the final 700 references used in the IRIS's toxicological review of benzo(a)pyrene, however they might have been screened out during the above-mentioned evaluation due to factors considered in the screening process.

16.0 Water Quality Standards May Not be Met

16.1 Comments

The general public expressed concern that due to the changes in the proposed ESD the Selected Remedy will not be able to adequately meet water quality criteria.

- Comments 12.4, 13.5, and 14.4. The EPA has not yet determined whether this weakened cleanup would uphold water quality standards to protect people, animals, and the environment from dangerous risks
- Comment 21.3. It would be irresponsible to reduce cleanup standards at the Portland Harbor at this time, especially as the EPA has not yet determined whether the work done under these proposed ESD changes would uphold water quality standards to protect people, animals, and the environment from dangerous risks.
- Comment 24.3. In addition, it is not yet clear that this modified (weakened) cleanup effort would succeed in upholding federal water quality standards.
- Comment 423. The EPA has not yet determined whether this weakened cleanup would uphold water quality standards to protect people, animals, and the environment from dangerous risks

Technical comments from parties that provided long format documents pertaining to the topic were received from: Yakama Nation, Earthjustice, and (b) (6) . The proposed ESD sediment cleanup criteria, especially both the nearshore and navigation channel RALs, need to be evaluated to determine whether they are likely to achieve cleanup levels within surface and porewater. The proposed ESD would reduce the ability of the cleanup to attain surface water remedial action objectives, not only for cPAHs, but also for other contaminants of concern like arsenic, chlordanes, BEHP, a phthalate, and DDE and DDD, metabolites of DDT. This is particularly troubling because the ROD would leave concentrations of many contaminants in surface water at concentrations ten times greater than the cleanup levels for human health and fish and other aquatic life.

16.2 Draft Response

The cleanup levels were selected in the ROD to protect beneficial uses (human health and ecological) designated for surface water (RAOs 3 and 7) and groundwater (RAOs 4 and 8) in the Willamette River. The cleanup levels are primarily based on the lower of the federal National Recommended Water Quality Criteria (NRWQC) established under Section 304(a) of the Clean Water Act, Oregon water quality criteria (organism+water), Oregon water quality criteria (chronic aquatic life), maximum contaminant levels (MCLs), and non-zero maximum contaminant level goals (MCLGs). EPA Regional Screening Levels (RSLs) were selected as the cleanup value when a value was not available from these sources for a specific contaminant. In addition, for RAOs 5 through 8, Toxicity Reference Values (TRVs) and Oak Ridge National Laboratory's Tier II secondary chronic values (SCVs) from the Portland Harbor baseline ecological risk assessment (BERA) were used to develop cleanup values to be protective of ecological receptors identified in the BERA. The changes described in the Explanation of Significant Differences (ESD) consider all

the criteria that were used to establish the surface water and groundwater cleanup levels for the Site.

ESD Table 6 summarizes the changes in post-construction reductions in surface water concentration and ESD Table 3? evaluates post-construction reductions in cancer risk. As stated in the ESD, "It is estimated that all surface water COC concentrations will be reduced to 10 times the CULs. Consistent with the ROD, it is expected that CULs (both risk-based and ARAR-based surface water levels) will be achieved over time through a combination of in-river cleanup with source control actions within the Site and actions taken to address toxic media within the watershed."

Commented [A3]: ?

Although post-construction cancer risk slightly increases with the higher nearshore total PAH RAL , this slight increase is not estimated to affect overall achievement of human health and ecological surface water RAOs. Although cancer risks at river mile 6.5 would increase by 93% (ESD Table 3), the revised risk estimate of 4 x 10-5 is within the range of post-construction cancer risks estimated for the evaluated river miles on the West without the RAL change (2 x 10-5 to 2 x 10-4) and is at the low end of the range of post-construction cancer risks estimated for the evaluated river miles on the West with the RAL change (4 x 10-5 to 2 x 10-4). Similarly, the revised cancer risk estimate at river mile 5.5 (1 x 10-4) also lies within these ranges. Please see Response #25 for further discussion regarding the cancer risk estimates for all RAOs, and Response #18 for a discussion regarding benthic risks. As noted in the ESD, based on higher total PAH loads in surface water between river mile 3.9 and 6.3 , it was determined that cleanup levels for surface water would not be achieved if the total PAH navigation channel RAL were increased above 170,000 µg/kg.

After the start~~completion~~ of remedial action, five-year reviews will be conducted to determine whether the remedy at a Site is, or upon completion will be, protective of human health and the environment. Should the remedial action or MNR not achieve cleanup levels or progress sufficiently toward achieving them and the corresponding ARARs, additional actions may be implemented as necessary.

17.0 Environmental Justice Issues

17.1 Public Comments

Comments stated that a weaker cleanup would disproportionately impact low-income and minority communities, and people of color. Comments included requests for equity of safety and level of contamination for all communities and neighborhoods along the Willamette River and requests for providing the communities impacted with employment opportunities during cleanup.

- Comment 28.1. I'm worried about the agency's insistence that the chemical benzo(a)pyrene is less toxic than previously thought, even though other studies directly contradict this claim. As a Black man, it is particularly worrying to know that a chemical linked to heart disease would be even more prevalent in the water supply, considering that we are predisposed to this condition as a community and overrepresented among the homeless population, who are arguably the most vulnerable to the negative consequences of this weakened cleanup.

- Comment 25.2. A clean river would be a major benefit the area's economy moving forward. With that in mind I feel the jobs cleaning up the river should be given to those populations most heavily impacted by the pollution. Which of course given the history of the area would be the poor, native peoples and people of color.

- Comment 47, 49, 494, 496, 498, 601, 630, 654. Because the chemical is concentrated in a north Portland hotspot, it should be reduced to the same levels as the upriver background levels of BaP in the urban Willamette River for the sake of equity in safety and river access for north and northwest Portlanders.

- Comment 62, 92, 94, 96, 453, and 457. Because the chemical is concentrated in north Portland, it should be reduced to equal the rest of the urban Willamette for the sake of equity.

- Comment 229. Portland has one of the most toxic sites in the country. The Portland Harbor has been dumped in for decades and it needs to be cleaned up for the health of our people who live here. The Environmental Protection Agency needs to stand with the communities affected by this toxic mess at Portland Harbor. The Yakama Nation and a diverse coalition of partners including Portland Harbor Community Coalition (PHCC), Willamette Riverkeeper, Portland Audubon, and Sierra Club fought hard for a cleanup plan that serves the best interest of the river and frontline communities. Please, please don't cut the funding or size of the area included in the cleanup. Please don't weaken cleanup standards by leaving a higher level of contamination in our river. These toxins not only threaten our drinking water, but affect wildlife, including the fish the members of the the Yakama Nation and others rely on. We cannot give an inch to the benefit of corporate polluters while leaving our health, and the health of our river, at risk. We need to clean up the river now for us and for future generations of Oregonians.

- Comment 559. The national Superfund program came into being as a response to social justice issues created by pollution. Proximity to industrial waste afforded shelter that created health risks for a vulnerable population. These risks were compounded by developmental constraints in the growth of children exposed to this environment. Sixteen years of exploratory testing and public input culminated with the Record of Decision being signed into law at the end of the Obama Administration. This legal contract between the aggrieved public and a history of opportunistic business practice reflects compromise necessary to allow the cleanup to move forward. The petition by several of the PRPs to~~o~~ amend this document prior to cleanup reflects the denial of social responsibility that created a superfund site. It is unreasonable to accommodate profit by the infliction of harm.

- Comment 605. The disproportionate impacts by race and class of this type of decision violates the spirit and intent of EO 12898, and probably Title VI. The impacts of Superfund cleanups by race are well known and documented (See A Spatial Study of the Location of Superfund Sites and Associated Cancer Risk.

- Comment 1079. A clean environment is part of health equity. St. John deserves a river its residents can enjoy. This community bears a disproportionate pollution burden - it is the

responsibility of the EPA to take this into account when making decisions. This is an environmental justice issue. I used to work for the EPA and expect better from the org.

- Comment 1127, 1128, 1129, 1130, 1131, 1132. Because the chemical is concentrated in north Portland, it should be reduced to equal the rest of the urban Willamette for the sake of equity. River access should be safe everywhere on the urban Willamette.
- Comment 1070. Dear EPA, Please respect the ROD that has been recognized. Please clean PAH levels as the rest of the urban river for equity and safe river access into North Portland. Stop indiscriminative usage dumping
- Comment 1086. I continue to have grave concerns about the Portland Harbor cleanup. I want equity throughout the communities on the river. I want every community member to consider and don't think its too much to ask for the highest standards in science and in safety. Make this work for everyone its possible. It right.
- Comment 1122. Its criminal to ignore the equity of cleaning up the Cathedral region of the Willamette River to a lessor standard as compared to the rest of the river. St. John's shouldn't be a 2nd class area.
- Comment 1066. Myth - everything is fine. Its just sediment. Reality - Children near the superfund have 1. more birth complications 2. High levels of poverty 3. Highest rate of learning disability. Until someone can answer why the cleanup needs to proceed. PS poverty and ethnicities does not cause learning disabilities. Myth - EPA started this process. Reality NW Natural gas is fracked gas. It is a stock on the NY stock exchange. It needs - is obligated to make lots of money. It is expanding its operation. The clean-up interferes with its mass expansion. Expansion of fossil fuels, in light of climate change is irresponsible. This is about PROFIT not people. Myth - This level of pollution doesn't cause health problems for the people in the area. Reality - No one ever asked the people if they had health problems or learning disabilities or cancer. Most people working on the Superfund actually never had the most impacted people. All other health concerns were ignored. Children were not looked at carefully. Myth - The superfund sites are in an "industrial sanctuary" thus the clean up can be reduced. Reality - The sites are near homes, schools, parks, tracks, bike lanes, stores. Question - If this was in another neighborhood would it be okay?
- Comment 603. PAH toxic levels should be cleaned to the same level as the rest of the urban river as specified in the Record of Decision for equity and safe river access in North Portland.
- Comment 1082. The safety of the river should be the same in St. Johns as the rest of Portland. St. Johns is primarily residential, and people are wanting to enjoy the water and beaches that are a part of this community. Please make decisions that promote a more enjoyable and safe future for everyone.
- Comment 1078. Toxic levels should be cleaned to the same level as the rest of the river. We should be able to use the river like other parts of Portland.

- Comment 940. EPA led a closed process to develop the ESD and ROD implementation activities. EPA failed to abide by best practices concerning transparency and public participation.
- Comment 940. The Proposed ESD would disproportionately impact subsistence fishers from low-income communities and communities of color. In adopting the ROD, EPA recognized that Portland Harbor contamination disproportionally impacts low-income people and communities of color. Even though the proposed ESD would take a sharp turn away from the ROD and weaken the cleanup standards, EPA has not even acknowledged the environmental injustices that would result from adopting it.
- Comment 940. To the extent that EPA reduces the amount of dredging at Portland Harbor, it would inevitably increase its reliance on fish advisories, which shifts the burden from the polluter to the people exposed to the health risks, contrary to Superfund's polluter pays principle
- Comment 936. We lack the money and political access to EPA headquarters that PRPs have utilized to bring about this expedited change and to weaken the baseline sampling at this site. It is incumbent upon EPA to take steps to rectify this power imbalance and ensure this cleanup proceeds in a fair and balanced manner that is protective of health and the environment.

Comments from parties that provided long format documents pertaining to the topic were received from: Earthjustice, Portland Harbor Community Coalition, and (b) (6) . The comments addressed similar concerns as the public comments listed above and provided greater details on how these low-income and minority communities will be impacted because of their reliance on fish consumption from the river. In addition, comments stated that ESD did not reflect environmental justice concerns because it was developed in a closed process without transparency or public participation. Commenters also stated their belief that disproportionate impacts to these communities possibly violates Executive Order 12898 and Title VI, and that PRPs should be held responsible to impacted communities.

17.2 Draft Response

EPA understands that there are significant environmental justice concerns with the Explanation of Significant Differences (ESD). Specifically, these concerns relate to the protectiveness of the final cleanup plan (or Record of Decision) and that it should be maintained for all community members. Other concerns focus on whether the ESD considers how communities with environmental justice characteristics would be affected (both generally and specifically for fish and shellfish consumption). Hence, there is a continued concern for health risks to vulnerable populations, related to equity in the final cleanup. Additionally, some commenters felt that this ESD was developed without transparency and public participation from community members.

Concern: The proposed ESD will result in less protection for some people

EPA heard many concerns in public comments that if EPA adopted the ESD, the Portland Harbor Superfund Cleanup will become less protective for some community or tribal members who live closer to areas where less dredging would occur in north Portland (particularly Terminal 4 and Gasco). We want to clarify that the final cleanup plan remains protective of human health and the

environment for all community members and tribal members under the ESD. The ESD for the Portland Harbor Site took cancer and non-cancer human health risk into account and examined how different cleanup level changes based on this update might influence ecological health. As a result, the national update to Benzo[a]pyrene has been properly applied Site-wide and with the issuance of the final ESD, the remedy will continue to protect human health and the environment from exposure to total polycyclic aromatic hydrocarbons (PAHs) as well as the other contaminants of concern (COCs) identified for the Site.

Concern: Environmental justice concerns regarding fish and shellfish consumption were not considered in the proposed ESD

EPA also received comments that the ESD did not consider how communities with environmental justice characteristics would be affected, particularly regarding fish or shellfish consumption. EPA appreciates the valuable information that was received in the public comments regarding fish consumption in the Lower Willamette River by communities with environmental justice concerns. We continue seek ways to improve and support fish consumption education, particularly for impacted communities. We recognize that this concern impacts the health and well-being of community members.

However, we want to clarify that an estimated decrease in dredging of 17 acres due to this ESD is not expected to result in an increased reliance on fish advisories because unlike other contaminants of concern at Portland Harbor (such as PCBs and dioxins/furans), polycyclic aromatic hydrocarbons (PAHs) do not preferentially accumulate in fatty tissue of fish. A reduction in dredging of PAHs is not anticipated to result in an increase in PAH levels in fish tissue. For shellfish, EPA also does not anticipate an increased reliance on shellfish advisories because long-term remedy effectiveness monitoring will be conducted to evaluate the effectiveness of the selected remedy at reducing clam tissue concentrations. If there are remedial action level (RAL) exceedances of PCBs or dioxins/furans in the areas that only had RAL exceedances for total PAHs (based on remedial investigation data), then active remediation will occur in these areas per the Record of Decision (ROD). As stated in the ESD, before any of the estimated 17 acres are eliminated from active remediation under the ROD, sampling must occur during remedial design at these 17 acres to confirm that there are no RAL exceedances for any contaminants of concern (COCs). As a result, with this ESD the remedy will still allow for additional fish and shellfish consumption after construction is complete and the fish consumption assumptions in the 2017 Record of Decision are not anticipated to change.

It is important to remember that background contaminant levels in the Willamette River will still make it difficult for those most at risk (such as Native Americans, subsistence fishers and women who are breastfeeding) to consume an unlimited quantity of fish and shellfish. Watershed-wide planning efforts by the Oregon Department of Environmental Quality (DEQ), EPA and other groups (such as the Willamette Watershed Toxics Reduction Partnership) may eventually reduce background contaminant concentrations and further increase fish consumption, although the Oregon Health Authority may still impose a fish/shellfish advisory based on broader watershed risks. Lastly, EPA will continue to coordinate with Multnomah County Environmental Health because of their critical work on the Fish Advisory Outreach Program for Portland Harbor. The program was funded for two years by the City, State and Port of Portland to inform potentially impacted communities of their health risk when consuming resident fish. Multnomah County

Environmental Health took a Human-Centered Design approach to outreach by holding workshops from September 2018 to June 2019 where ideas are designed for and by the impacted community.

Concern: Other environmental justice concerns not considered in the ESD from community members whose health has been disproportionately impacted by the pollution over several generations

EPA also heard other environmental justice concerns on the ESD from community members and tribal members that ranged from a general lack of consideration of environmental justice concerns related to the ESD to other concerns such as prioritizing job training. It is true that EPA is directed by Executive Order 12898 to identify and address environmental justice concerns for minority and low-income populations to the maximum extent feasible. Additionally, EPA's EJ 2020 Action Agenda is meant to "promote the integration of environmental justice across our nation's larger environmental enterprise." EPA takes environmental justice concerns very seriously both nationally and at the Portland Harbor Superfund Site and recognizes that its relationships with community groups and individuals, tribal members, and other interested parties are vital in addressing environmental justice concerns. In recognizing the concern for certain health conditions that may contribute to cardiovascular disease and cancer, our goal is to also protect the health of vulnerable populations. This ESD does not negate all the previous environmental justice work and information collected and the necessity for environmental justice work to continue at the Portland Harbor Superfund Site.

EPA has worked to understand environmental justice concerns in the Portland Harbor cleanup area in the past and continues to spend significant time and resources on outreach to communities with environmental justice characteristics. A history of EPA's work prior to the 2017 release of the final cleanup plan for the Portland Harbor Superfund Site is provided in the ROD Responsiveness Summary **(Section 2.35.2)**. Since the Record of Decision, we have continued to provide updated environmental justice information through EJ Screen and share that information with community leaders. At the June 12, 2019 EPA community leader meeting, EPA Region 10's Environmental Justice Coordinator Sheryl Stohs briefly presented plans to provide additional environmental justice information to community leaders. Additionally, updated environmental justice information will be incorporated into the public feedback draft of EPA's revised Community Involvement Plan for the Portland Harbor Superfund Site that is currently planned for release in late 2019.

Regarding job training, this ESD will not affect the implementation of EPA's Superfund Job Training Initiative (SuperJTI) at the Portland Harbor Superfund Site. EPA's goal through the SuperJTI program is to work with all communities affected by the Site (including communities with environmental justice concerns) to develop job opportunities that remain long after construction is complete at the Site. EPA is currently evaluating how the SuperJTI program may apply to the Portland Harbor Superfund Site.

Concern: The ESD was created without transparency and because of the power imbalance with potentially responsible parties (PRPs)

Lastly, EPA received comments stating that this ESD did not reflect environmental justice concerns because it was developed in a closed process without transparency or public participation. Some community members also commented that a power imbalance exists between

PRPs and community members regarding access to EPA and that this disparity resulted in this ESD.

EPA has provided more access to information with this ESD process than is required by the Superfund law. Under the law EPA is not required to develop an ESD, hold information sessions, nor conduct a public comment period. However, because EPA recognized that the ESD was a significant change that needed to be communicated to our communities and tribal members, we decided to offer a public comment period and provide three information sessions as part of our outreach during the public comment period (two in-person and one webinar that was also recorded and posted online). Additionally, in advance of the public comment period for the ESD, EPA provided a general update to key community and tribal member representatives about the national EPA Integrated Risk Information System (IRIS) toxicity change to the Benzo(a)pyrene (BaP) and that EPA was considering how this change might affect the Portland Harbor Superfund Site.

Regarding a power imbalance with PRPs, EPA acknowledges that because under the Superfund law, we look to PRPs to perform the cleanup work, EPA has frequent communication with PRPs. At times, EPA is engaged in confidential settlement negotiations, but at other times, there are day to day interactions and communications regarding technical issues and ongoing work that PRPs are undertaking and EPA is overseeing. We can always work to improve how the community is informed about the status of the cleanup and welcome feedback and suggestions. EPA also acknowledges, as documented in the administrative record, that a couple PRPs highlighted the potential effects of the IRIS BaP change on the Portland Harbor Superfund Site before EPA decided to issue an ESD. EPA understands that PRPs who have stepped up to perform remedial design need to know how the BaP change may affect their design work sooner rather than later. EPA determined that addressing the effect of the BaP toxicity change now would not reduce protectiveness and would not delay ongoing design work.

In conclusion, EPA takes the community and tribal member concerns regarding environmental justice seriously and will continue to work to engage community groups, tribal members, and individuals to ensure the appropriate measures are taken addressing risks and impacts to communities with environmental justice concerns.

18.0 Ecological and Wildlife Risks Are Not Addressed

18.1 Public Comments

Comments from the general public express concern that the ESD did not adequately assess ecological risks for wildlife.

- Comment 5.6. The ecological consequences of a change to the ROD have not been undertaken.
- Comment 1064. Safety of environmental receptors, such as wildlife, especially endangered species, should be considered when interpreting the change, not just safety of human activities. Leaving BaP and six other PAHs in river sediments where the chain of life begins

harms all wildlife indefinitely. It does not meet the community goal of safe river habitat expressed in the response to the Proposed Plan.

- Comments 47, 49, 62, 92, 94, 96, 453, 457, 494, 496, 497, 498, 501, 601, 630, 654, 1127, 1128, 1129, 1130, 1131, 1132. Wildlife should be considered when interpreting the change. Leaving the chemical in river sediments where the chain of life begins, harms all wildlife.

Technical comments from parties that provided long format documents pertaining to the topic were received from: Yakama Nation, Earthjustice, League of Women Voters, and Portland Harbor Community Coalition. They address the same concerns as the public comments listed above with additional concerns summarized below:

- The ESD notes that the revised CSF does not affect the ECO CULs, so the 23,000 µg/kg RAL still applies to all nearshore and navigation channel sediments for the protection of benthos. However, EPA argues that the HH RAL of 30,000 µg/kg is only "slightly more" than the 23,000 µg/kg benthic RAL. EPA further argues that the area of sediments exceeding the benthic RAL is limited, so EPA accepts the RAL of 30,000 µg/kg as sufficiently protective. We do not feel that these arguments are sufficient or appropriate to relax the protection of natural resources. The benthos were selected in the ecological risk assessment and ROD as surrogates for exposures of site COCs to many other organisms. Hence, the consequences of the ESD change are not as simple to predict as EPA states. Further, it is unlikely that natural recovery will achieve the CULs for benthic risk within a reasonable restoration timeframe.

- The ESD does not address RAO 6. The nearshore RAL, and especially the navigation channel RAL, are set so high that it is unlikely natural attenuation will achieve RAOs for risks to natural resources within a reasonable restoration timeframe.

- The new IRIS assessment addressed one type of health effect, cancer. The IRIS cancer risk assessment for BaP is based on the study of human health risks and has no bearing on ecological risks. The toxicity of BaP and other PAHs to ecological endpoints is unaffected by any change in predicted carcinogenicity in humans expressed in the IRIS report. These studies did not evaluate the risk to wildlife and plants from increased exposure.

- EPA included in the ESD information indicating that weakening the cPAH standards would worsen environmental risks at the end of the cleanup. Specifically, the ESD would reduce the area of contaminated groundwater plume remediated by 7% (Table 7, down to 32% from 39%).

- EPA must also ensure that cleanup standards are adequate to protect the environment. Surface water, groundwater, aquatic life, and numerous animals would be less protected by the ROD with the ESD. EPA has failed to justify subjecting ecological resources, including fish, birds, benthic invertebrates and other animals, to greater risks. Nor has it assessed the full spatial and temporal extent of more severe contamination over time.

- The ESD must account for the greater risk for ecological endpoints, including fish, birds, benthic invertebrates and other animals by increasing the removal of PAHs elsewhere, or maintaining the removal footprint in order to protect non-human endpoints. There has yet

to be enough shallow water habitat planned for the areas outlined in the ESD to come close to healthy environmental standards, critical for fish and other species. Did EPA take into account the City of Portland studies on this same subject that were completed as part of the NRDA process?

18.2 Draft Response

The comments under this category response are focused on whether the ESD will adversely affect the Selected Remedy's ability to achieve RAO 5, RAO 6, and RAO 7.

- RAO 5 – Sediment: Reduce risk to benthic organisms from ingestion of and direct contact with contaminants of concern (COCs) in sediment to acceptable exposure levels
- RAO 6 – Biota (Predators): Reduce risks to ecological receptors that consume COCs in prey to acceptable exposure levels
- RAO 7 – Surface Water: Reduce risks to ecological receptors from ingestion of and direct contact with COCs in surface water to acceptable exposure levels

Overall, the analyses presented in the ESD demonstrate that ESD changes would not significantly affect the ability of the Selected Remedy to achieve RAO 5, RAO 6 and RAO 7. Regarding RAO 5, as noted in Section 3.2 of the ESD, the change in BaP cancer slope factor (CSF) does not affect the benthic risk total polycyclic aromatic hydrocarbon (PAH) cleanup level (CUL), and the CUL for total PAHs and protection of the benthic community is unchanged at 23,000 µg/kg. As shown in ESD Table 4, based on RI/FS data, revising the total PAH remedial action level (RAL) to 30,000 ug/kg may reduce the percentage of the Site achieving 10 times the benthic risk CULs (which would be 230,000 ug/kg for total PAHs) from 72% to 69% of the Site following construction. The remainder of the benthic risk areas are expected to achieve protectiveness through monitored natural recovery (MNR). Since a model was not capable of predicting accurately how long MNR would take, monitoring will be conducted to determine whether natural recovery is occurring at a rate sufficient to meet cleanup levels in a reasonable time frame. Based on criteria developed in the long-term remedy effectiveness monitoring plan, additional actions may be necessary if it is determined that MNR will not achieve cleanup levels.

Regarding RAO 6, as shown in ESD Table 5 and on ESD Figure 11, the greatest percentage changes in ecological risk from post-construction fish and wildlife prey consumption were observed in sediment decision unit (SDU) 4.5 East and SDU 6 West, where the total hazard indices increased from 1.2 to 1.5 for both. While this appears to be a slight increase, 0.3 is within potential calculation variances and does not change the significance of the result, which is the hazard index is only slightly greater than 1. In addition, PAHs were not identified in the Record of Decision (ROD) as a COC for ecological receptors that consume prey at the site. Thus, the conclusion in the ROD remains the same that wildlife will be able to safely consume prey from within the Site immediately after construction of the Selected Remedy, since all non-cancer risks, including all ecological risk, on a Site-wide scale will be addressed.

Regarding RAO 7, as shown in the changes in post-construction reductions in surface water concentration (ESD Table 6), changes in the reduction in surface water concentrations are 1% or less, and it is estimated that all surface water COC concentrations will be reduced to 10 times the

CULs (Section 4.0 of the ESD). Consistent with the ROD, it is expected that CULs [both risk-based and applicable or relevant and appropriate requirement (ARAR)-based surface water levels] will be achieved over time through a combination of in-river cleanup with source control actions within the Site and actions taken to address toxic media within the watershed including control of upriver sources. With regards to shallow water habitat, construction of shallow water habitat will be considered during remedy implementation through Clean Water Act and/or Endangered Species Act mitigation.

As noted in Section 4.0 of the ESD, risk to aquatic life is unaffected by the change in the BaP CSF. Within the navigation channel, EPA determined that the total PAH RAL of 170,000 µg/kg applicable to the navigation channel should not be revised because it may affect the ability of the Selected Remedy to achieve the total PAH CUL of 23,000 µg/kg (RAO 5) for protection of the benthic community through natural recovery. In addition, an increase in the total PAH navigation channel RAL would reduce the remedial footprint, resulting in an increase in total PAH load between river mile 6.3 and 3.9, which may result in a reduction in the ability of the Selected Remedy to attain RAO 3. Although EPA determined that increasing the total PAH RAL from 13,000 to 30,000 µg/kg for the nearshore RAL may result in a slight reduction in the ability of the Selected Remedy to attain the total PAH CUL of 23,000 ug for protection of the benthic community (RAO 5) at the end of construction, it will not have a significant effect on the ability of the remedy to protect recreational beach users or to attain RAOs 2, 3, 5, or 7, and it is expected that RAO 5 will be achieved via MNR over time.

The ecological RAOs impacted by the ESD are RAO 5, RAO 6, and RAO 7. The benthic assessment measurement endpoints for RAO 5 were determined at the organism or individual level, and thus, are protective of threatened or endangered species. PAHs were not included as a COC under RAO 6, and RAOs 7 is likewise unaffected by the ESD. Thus, the effect of the ESD on threatened or endangered species is expected to be negligible.

Although the ESD would reduce the area of contaminated groundwater plume remediated by the Selected Remedy by 7% (from 39% to 32% as shown in ESD Table 7), consistent with the ROD, achievement of the total PAH CUL for the remainder of the contaminated groundwater will be dependent on the adequacy of source control actions.

As noted in Section 4.0 of the ESD, the amount of principal threat waste (PTW) addressed by the updated remedy is expected to remain unchanged based on the ESD; hence, the spatial and temporal extent of "severe contamination" addressed by the Selected Remedy remains the same.

20.0 Oregon Water Quality Standards and ARARs May Not be Met

20.1 Comments

Technical comments from parties that provided long format documents pertaining to the topic were received from: NW Natural, Yakama Nation, Earthjustice, and Port of Portland. National Recommended Water Quality Criteria (NRWQC) for benzo(a)pyrene is based on outdated science and EPA should update the cPAH cleanup level in ROD Table 17 to the applicable Oregon water quality standard. In addition, the same commenter states that the applicable Oregon water quality standard is not exceeded at the site. The Site surface water meets Oregon water quality standards applicable to cPAHs at the "no action" level, and no PAH cleanup is necessary to protect surface

water (RAO 3). ROD Table 17 sets the cPAH surface water cleanup level at 0.00012 µg/L based on the National Recommended Water Quality Criteria (NRWQC) for benzo(a)pyrene - not on the Oregon water quality standard. NRWQC are not applicable to CERCLA cleanups but may be relevant and appropriate at some sites. The 0.00012 µg/L benzo(a)pyrene NRWQC, which is based on outdated cancer slope factors, no longer represents good science and is no longer relevant or appropriate to RAO 3 (reduce cancer and non-cancer risks to people from surface water at the site).

The comments also request that the EPA anticipate future update to federal ambient water quality criteria (AWQC) for surface water cPAH based on the updated IRIS cancer slope factor (CSF) values.

The comments express concerns related to exceedances of cancer risks levels of 10-6 at the recreational beaches (ESD Table 9) and increases in cancer risk from 10-5 to 10-4 for the sediment (RAO 1 in ESD Table 2) and fish consumption (RAO 2 in ESD Table 3) remedial action objectives. Additional concern is expressed regarding cancer risk from fish consumption and how the ESD would affect the recommendations for quantity of fish consumed.

20.2 Draft Response

EPA notes that neither the NRWQC nor the Oregon water quality standard have been changed and thus are still considered applicable or relevant and appropriate requirements (ARARs) for the Portland Harbor Site. CERCLA requires that remedial actions comply with all requirements that are applicable or relevant and appropriate, unless waived. Specifically, regarding NRWQC, CERCLA requires that remedial actions must require a level or standard of control which at least attains water quality criteria established under section 304 or 303 of the Clean Water Act when relevant and appropriate under the circumstances of the release. 42 USC Section 9621(d)(2)(A). Consistent with CERCLA, the cleanup levels for RAO 3 (surface water/human health) and RAO 4 (groundwater/human health) are based on the lower of the federal NRWQC established under Section 304(a) of the Clean Water Act, Oregon water quality standards, maximum contaminant levels (MCLs), and non-zero maximum contaminant level goals (MCLGs), as presented in Table 2.1-4 of the feasibility study report.

The MCL for cPAH (measured as benzo(a)pyrene equivalents) considered protective of human health is 0.2 µg/L (EPA MCL for cPAH). The cleanup level for cPAH in groundwater in ROD Table 17 (0.00012 µg/L) is below the more stringent EPA's drinking water regulations. Updating IRIS CSF values for criteria and anticipating future updates to criteria is beyond the scope of the ESD. Future updates to toxicity and water quality criteria, if implemented by the federal and state government, will be considered during the 5-year review process.

Although the comment states that the applicable Oregon water quality standard is not exceeded at the site, the Portland Harbor database shows that some surface water samples contain carcinogenic PAHs measured as benzo(a)pyrene equivalents exceed the state criterion of 0.001 ug/L and the NRWQC of 0.00012 µg/l. This includes samples LW2-015 (0.004 ug/L) and LW2-3015 (0.009 ug/L).

Regarding the increase in cancer risks, although the RAL was based on achieving a 1 x 10-6 direct contact risk level following construction completion, as stated in the comments, the net effect of

the ESD change is a slight increase in overall post construction risk. However, the evaluations presented in the ESD demonstrated that a total PAH RAL of 30,000 µg/kg will protect 100% of the nearshore half-river mile exposure units by achieving the updated direct contact cPAH CUL of 774 µg/kg (ESD Table 1) as measured on one-half rolling river mile SWACs throughout the Site. Thus, the total PAH RAL of 30,000 µg/kg was selected. EPA determined that to increase the total PAH RAL above 30,000 µg/kg would result in an unacceptable increase in overall risk relative to the selected remedy, post construction. Fish consumption advisories will still be required post-construction under all of the alternatives until the CULs are met to provide additional risk reduction. Fish consumption advisories are not enforceable and are generally understood to have limited effectiveness since compliance is voluntary. Therefore, one objective of the public education/outreach effort would be to improve voluntary compliance with the advisories. In order to minimize reliance on institutional controls, land use restriction mechanisms, such as RNAs and environmental covenants or equitable servitudes, will be used to protect capped areas where contamination is left in place at concentrations greater than CULs needed to achieve RAOs. Please see Response #25 for further discussion regarding the slight increase in cancer risks for all RAOs.

21.0 Riverbanks

21.1 Comments

Detailed comments were received from the Yakama Nation and (b) (6) . The comments addressed concern regarding the inability of riverbank (RAO-9) and beach (RAO-1 HH and RAO-5 ECO) goals from being achieved solely through natural attenuation. Comments also expressed a concern that river banks not targeted for active remediation will be unable to meet CULs through natural attenuation. A comment requested rewording of the following statement in the proposed ESD: "It is important to note that ROD river banks with no active remediation offshore must still undergo characterization of river bank CULs and potential active remediation for focused COC's exceeding RALs and/or presence of PTW." to: "It is important to note that ROD river banks with no active remediation offshore must still undergo characterization of river bank CULs and evaluate the need for active remediation of all appropriate COCs."

21.2 Draft Response

The description in the ESD of applying the nearshore sediment RALs and PTW thresholds to river banks is consistent with the ROD and is not a change. The ROD explains that RALs and PTW thresholds define active remediation areas in sediment areas (SMAs) and that the adjacent river banks would be remediated along with the SMA. Selected Remedy descriptions in ROD Sections 10.2.6, 11, and Figure 28 indicate that the RAL and PTW thresholds define active remediation areas in the shallow and river bank regions. To clarify the different scenarios, EPA added the statement in ESD Section 4.0, subsection River Banks and Principal Threat Waste – "*ROD river banks without an adjacent SMA, as mapped in ROD Figure 30, or no active remediation offshore, should be characterized for river bank COCs and undergo potential active remediation for focused COC's exceeding RALs and/or presence of PTW. When the river bank COCs are present at concentrations greater than CULs and less than RAL concentrations, the evaluation will determine whether an action is needed to achieve the ROD protectiveness objectives within a reasonable time.*"

Although, the RAL and PTW thresholds exceedances define areas requiring active remediation in the nearshore sediment and the river bank regions, the Selected Remedy also has a requirement to address all areas where contaminant concentrations exceed the CULs. In the case of the river bank, the nature of the response for CUL exceedances that are less than the RALs, will be addressed through a risk-based decision process. The process would identify and select an action commensurate with the risk and consistent with the RAOs for river banks related to human health risk, ecological effects, and recontamination of the in-water remedy. As stated in the ESD, the river banks must undergo characterization of all river bank COCs (ROD Table 17) and this data is used to determine areas exceeding the river bank CULs. These requirements to address CUL exceedances and meet the RAOs for the both the shallow and the river bank regions are described in the ROD and in river bank guidance that has been prepared by EPA.

Concerns that areas of the site not having active remediation may result in CULs not being met and RAOs not be achieved, will be evaluated through the monitoring requirements of the Selected Remedy described in Section 14.2.7 of the ROD, which includes river bank monitoring, and the five-year review process described in Section 14.2.8 of the ROD. As part of each five-year review, monitoring data will be evaluated and need for any additional action to meet the RAOs will be determined.

22.0 Changes to BaP Toxicity Values Should be Deferred to Five-Year Reviews

22.1 Comments

One comment from the general public expressed a belief that EPA should only consider new information during five-year reviews provided for in the statute.

- Comment 5.7. The ROD spells out an obligation for EPA to review in 5 years any changes that may occur. That statute should be followed in the case of BaP and any other contaminants.

Technical comments from parties that provided long format documents pertaining to the topic were received from: Portland Harbor Community Advisory Group, Yakama Nation, Earthjustice, and the League of Women Voters. The comments address the same concerns as the public comments listed above but in greater detail. The Portland Harbor CAG indicated that the ESD forced the issue [BaP cancer slope factor value changes] before the five-year review as stated in the ROD, and that the reason the five-year review was included in the ROD was so continual and repeated changes with toxicity screening levels would not be used as delay tactics. The Yakama Nation indicated that the appropriate time to make ROD changes related to the IRIS update on BaP cancer slope factor is during the five-year review cycle (January 2022) and reopening the ROD less than 2 years into the process sets the stage for performing parties to demand changes at their whim. Earthjustice stated that EPA should wait to make any changes to the cleanup standards or the remedy until the first five-year review when it will have the benefit of monitoring and experience under the cleanup to evaluate the adequacy of the ROD cleanup standards and time to examine the impact of the new BaP cancer risk estimate on other cPAHs and mixtures. The League of Women Voters indicated that EPA did not have a requirement to consider the new BaP value [IRIS toxicity value] at this time and that the five-year reviews required by CERCLA are the appropriate time to respond to such updates.

22.2 Draft Response

CERCLA Section 121(c) provides that "[i]f the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented." 42 U.S.C. Section 9621(c). Five-year reviews assess whether remedial actions started remain protective of human health and the environment, and as commenters have indicated, one way that assessment is conducted is to review whether toxicity data and related cleanup levels used at the time of the remedy are still protective. However, the statute allows for five -year reviews to be conducted sooner than every five years and it also does not prohibit considering new information at any time in the cleanup process. References to the five-year process were placed in the Portland Harbor ROD solely to document that the selected remedy results in contamination remaining at the site, and the statute requires five-year reviews to be performed.

The change to the BaP IRIS cancer slope factor was identified prior to the initiation of the remedial action, during initial phases of remedial design. EPA reviewed the new information regarding the BaP toxicity value and determined that there were areas designated for active cleanup solely due to direct contact risk to BaP that based on new science no longer presented direct contact risk (or any other risk) from BaP. Put another way, 17 acres slated for dredging or capping had PAH concentrations that were at or below toxic levels to humans. Risks due to contamination from other COCs on these 17 acres would be addressed through natural recovery like a majority of the site. Based on this information, EPA determined a change to the remedy was appropriate to reflect this new information. EPA is cognizant that delays to cleanup can occur if the selected remedy is changed every time new toxicity information arises, and that is not EPA's intent for the Portland Harbor ROD. EPA will use its discretion in assessing the need or appropriateness of future changes to the ROD as new information comes to our attention.

Considering this significant change now, rather than after initiation of the remedial action during five-year reviews, has benefits not indicated by commenters. For instance, reduced cleanup areas from reevaluation of the BaP toxicity value may result in expedited design and quicker initiation of the remedy as requested by the public. It may also reduce the short-term impacts to workers, public, and the environment from generating and handling of contaminated sediment and be a more green and sustainable approach through wise use of resources, such as fuel and reduced emissions, than retaining a CUL for BaP that is overly conservative, i.e., lower than what is considered safe in the latest scientific consensus in providing protection of human health and the environment as demonstrated by studies supporting the IRIS toxicity value update.

23.0 The Shellfish Risk in Navigation Channel is Unknown

23.1 Comments

Technical comments from parties that provided long format documents pertaining to the topic. Detailed comments were received from, NW Natural, Yakama Nation, and Miller Nash Graham. The comments suggest that the clam consumption exposure scenario is incomplete within the navigation channel because there is no factual evidence of anyone harvesting shellfish from the navigation channel and the ability to harvest fish in navigational channel due to restricted site

access, marine traffic, water depth, temperature, currents, and easier access to nearshore habitat where shellfish are known to be present.

The comments also suggest that the prohibitions on harvesting Asian clams (Corbicula fluminea, which are an invasive, non-native species) further reduce the potential for humans to harvest and consume clams from the navigation channel. Specifically, the comment note that existing institutional controls are in place to prohibit clam harvesting. Oregon law (Oregon Administrative Rule 635-056-0000) prohibits the possession, transportation, and sale of non-native wildlife. In addition, Oregon Sport Fishing Regulations state that it is illegal to harvest or possess any freshwater clams and mussels (ODFW 2018). This is a statewide regulation.

The comments also state that remediation of PAHs in the navigation channel is not necessary to reduce risk from shellfish consumption (RAO 2) because EPA's baseline human health risk assessment identified no human health risk from clams harvested within the navigation channel, based upon the assumption that clam harvesting would occur only in nearshore areas with accessible water depths. The comments further suggest that EPA explicitly assumed in the BHHRA that clam harvesting occurred only in nearshore areas: "EPA acknowledges that an appropriate exposure area should be determined in consideration of water depth (i.e., nearshore areas) and the area over which a sustainable shellfish harvest consistent with the clam consumption is possible." Based on this information, the comments concluded that EPA's application of a cPAH sediment cleanup level for clam consumption in areas of the river in which the BHHRA found no unacceptable clam consumption risk is inconsistent with the NCP and arbitrary and capricious.

The comments also question EPA's determination that that the RAO 2 cPAH cleanup level should be updated to 1,076 µg/kg but not providing any evaluation of whether the 170,000 µg/kg PAH RAL applicable to the navigation channel was necessary or appropriate to achieve the interim target for RAO 2. Specifically, the comments requested application of institutional controls to limit shellfish consumption in the navigation channel rather than dredging or capping based on consideration of waterway use.

The comments also request that EPA confirm the findings of the EPA risk assessment that clam harvesting is unlikely in deep water areas and to state explicitly that institutional controls could be used to prohibit harvesting of any clams that may be present within the navigation channel, eliminating the need for expensive and disruptive dredging on the basis of this hypothetical and undocumented exposure pathway.

Another group of comments is concerned that the updated CUL for sediments based on the clam consumption of 1,076 µg/kg is greater than the 774 µg/kg cPAH CUL for direct contact and as a result, the navigation channel RAL not protective based on RAO 2 and requires unlikely amount of natural attenuation to occur over the reasonable restoration timeframe of 30 years to demonstrate compliance.

23.2 Draft Response

EPA evaluated whether the change in BaP CSF necessitated revising the total PAH RAL of 170,000 µg/kg applicable to the navigation channel. Considering RAO 2, updating the BaP CSF along with the correction would result in a revised cPAH shellfish consumption sediment CUL of 1,076

µg/kg. This would result in a maximum post construction risk to human health from cPAH based on the shellfish consumption exposure pathway of 3 x 10-6 as measured on a rolling river mile basis, which is four times greater than the risk to human health from cPAH that was presented in the ROD but the incremental increase over what was calculated in the ROD is only 2 x 10-6. The risk range established by the NCP is 10-4 to 10-6 and EPA's goal of protection for cancer risk is 10-6, with risks greater than 10-4 typically requiring remedial action. The 2 x 10-6 slight increase in risk from cPAH was determined to be minimal when compared to the total risk calculated from all COCs presented in Table J2.3-6a of Appendix IV of the ROD, which estimated the maximum post construction risk to be 2 x 10-4 in the navigation channel. Based on this post-construction risk level, EPA determined that the total PAH RAL of 170,000 µg/kg applicable to the navigation channel should not be revised. Thus, total PAH RAL applicable to navigation channel sediments for the Selected Remedy remains unchanged by the ESD.

As noted by the comments, the updated CUL for sediments in the navigation channel of 1,076 µg/kg is greater than the 774 µg/kg cPAH CUL for sediments in the nearshore. In the nearshore, the 774 µg/kg cPAH CUL in sediment is based on direct contact (ingestion and dermal contact) with in-water sediment, which is most likely to occur in the nearshore areas outside of the navigation channel. In the navigation channel, the water depth is federally maintained at 40 feet, thus direct contact (ingestion and dermal contact) with sediment in the navigation channel would be limited since sediment contacted at the bottom of the channel would mostly be washed off when the receptor emerges from the water. The CUL for sediments in the navigation channel is based on clam consumption by tribal fishers. Tribal net fishing in the navigation channel is unlikely to entrain bottom sediments, thus direct contact (ingestion and dermal contact) with sediment in the navigation channel would be limited.

Regarding the timeframe of natural attenuation, the effectiveness of natural recovery processes involves many variables which can change over time as site conditions change. As such, long term monitoring and reassessment during five-year reviews implements a process through which periodic assessments can be made to assess whether the remedial actions started remain protective of human health and the environment, whether the toxicity data and related cleanup levels selected at the time of the remedy are still protective, and whether new information or technology has developed which could change the remedial action.

EPA also evaluated the effect of changing the 170,000 µg/kg RAL on RAOs 3, 5 and 7. EPA determined that retaining the 170,000 µg/kg RAL was necessary due to the observed increase in total PAH load to surface water pertaining to RAOs 3 and 7 between river mile 6.3 and 3.9 and because the lack of natural recovery processes in the navigation channel between RM 5 and 7 that pertain to RAOs 3, 5 and 7.

- RAO 3 and 7: Based on figures from Section 1 of the Portland Harbor FS, total PAH surface water load is observed to increase between river mile 6.3 and 3.9, suggesting that the high levels of PAH contamination within the Navigation Channel between RM 5 and 6.6 are contributing to the PAH concentrations river mile 6.3 and 3.9. Although the source of PAH contamination to the water column likely includes contaminated sediments in both the nearshore area and Navigation Channel, remediation of PAH contaminated sediments within the Navigation Channel is expected to contribute to a reduction of PAH water

column concentrations and facilitate progress towards achieving RAOs 3 and 7. Increasing the total PAH navigation channel RAL above 170,000 µg/kg may result in a reduction in the ability of the Selected Remedy to attain RAOs 3 and 7. A more detailed discussion of this analysis is provided in Attachment A "Evaluation of Potential Modifications to Total PAH Navigation Channel RAL" in Appendix D of the ESD.

- RAO 5: A multiple line of evidence evaluation presented in the Portland Harbor FS of natural recovery processes (including sediment deposition rates, consistency of deposition, sediment grain size, propwash potential, subsurface to surface sediment concentration ratios, and wind and wake generated waves) at the Site determined that the navigation channel between RM 5 and RM 7 is generally not conducive to natural recovery. As a result, EPA determined that increasing the navigation channel RAL above 170,000 µg/kg may limit the ability of the remedy to achieve the total PAH CUL of 23,000 µg/kg for protection of the benthic community (RAO 5) over time. As a result, active remediation of PAHs over 170,000 ug/kg within the navigation channel between RM 5 to RM 7 is necessary to protect human health and the environment.

Regarding application of the shellfish cleanup level to the navigation channel, the HHRA evaluated the risks associated with clam consumption on per river mile basis for each side of the river as well as for the entire Study Area. It should be noted that clam tissue data for the evaluation of human health risks associated with the clam consumption exposure scenario were only available for nearshore areas. The lack of exposure and risk information in the navigation channel does not preclude application of the clam consumption cleanup level to the navigation channel.

Overall, the commenters have not provided sufficient supporting information to demonstrate that the clam consumption exposure scenario is incomplete within the navigation channel. EPA addressed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.3.6): "EPA…. Disagrees that the shellfish consumption pathway is not complete for the navigation channel."

Although both the Oregon Sport Fishing Regulations (ODFW 2019) and Updated Fish Advisory for Resident Fish and Shellfish, Lower Willamette River (Oregon Health Authority, 2018) state that it is illegal to harvest or possess any freshwater clams and mussels, these regulations and fish advisories are institutional controls that have unreliable effectiveness. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that, "The use of institutional controls shall not substitute for active response measures… as the sole remedy unless such active measures are determined not to be practicable…" 300 C.F.R. § 300.430(a)(1)(iii)(D). There is no information in EPA's record to support that implementation of institutional controls, such as access controls to large portions of the river, can be implemented or would be reliable or effective in the long-term. In the FS or ROD, long-term access controls in lieu of capping or dredging were not included or evaluated as an alternative for this stretch of river. If they were, such ICs would likely be determined to have unreliable effectiveness, not be protective of ecological exposures, be practically difficult to implement, and have unknown long-term reliability, in addition to the other challenges that option presents (e.g., future use; tribally protected treaty rights; restricting access on Oregon Department of State Lands sediments; state and public acceptance). Institutional controls would need to be adequately implemented, monitored, and enforced. In

Commented [A4]: This language is too harsh since we plan on using institutional controls for part of the remedy

addition, the updated fish advisory notes that tribes have a Tribal exception that allows them to harvest mussels, and that anecdotal information indicates that subsistence fishers may be harvesting clams and mussels from the river even though it is illegal. Refer to response #26 for additional discussion of clam exposure at Terminal 4.

25 Concerns with RAL Calculations

25.1 Comments

Technical comments from parties that provided long format documents pertaining to the topic were received from: NW Natural, Port of Portland, Miller Nash Graham, and the Yakama Nation. The majority of the comments express concern that neither the surface water (RAO 3) nor the benthic risk (RAO 5) should be limiting factors for setting the TPAH RAL goals. Regarding RAO 3, the comments state that although the federal ambient water quality criteria (AWQC) have yet to be updated with the new IRIS CSF, all FS alternatives, including the No Action Alternative, meet the interim risk level from surface water exposure at 10 times the ROD cleanup level. Moreover, current average site cPAH surface water concentrations (approximately 0.00075 µg/L) are below the anticipated update to the federal AWQC which is expected to increase from 0.00012 µg/L to approximately 0.00088 µg/L. The comments cite the Portland Harbor Baseline Human Health Risk Assessment (BHHRA) as having evaluated risks from exposure to surface water during recreational or occupational activities or from potential future use of the Lower Willamette River as a domestic water source.

The comments also state that the ESD results would cause negligible change to benthic risk as compared to the selected ROD remedy. Based on the comments and their supporting calculations, changing a TPAH RAL from 69,000 µg/kg (Alternative D) to 170,000 µg/kg (Alternative B) only slightly affects the change in benthic risk area (from 50% as defined by 10 times benthic PRGs to 48%). As a result, nearshore RAL of 88,000 µg/kg would address both RAO 3 and RAO 5.

Another comment recommends that USEPA should apply a revised TPAH RAL of 95,000 µg/kg using methodology that the commenter believes maintains the integrity of the ROD, achieves the target risk reduction for cPAHs (RAO1), meets the ROD goal for benthic risk reduction (RAO 5), and has negligible effect on the post-remedy SWACs for other Focused COCs. Their analysis of potential change in TPAH RALs on site-wide focused COC SWACs prompted the recommendation of 90,000 µg/kg TPAH RAL as it would have no significant impact on resulting Post-remediation SWACs for other Focused COCs, and it continues to achieve the RAO 5 goal.

The comments state that the updated nearshore total PAH RAL of 30,000 µg/kg should be based on achieving the interim target for human health direct contact risk of 1 x 10-5 rather than the final cleanup level of 1 x 10-6 for direct contact with sediments and that to do otherwise is inconsistent with the FS and ROD. The comments further state that the updated RAL will require remediation of some areas that do not pose unacceptable risk due to PAHs and suggest that the both the nearshore and navigation channel RALs be set at 170,000 µg/kg.

Other comments argue that increasing the TPAH RAL from 13,000 µg/kg to 30,000 µg/kg in the nearshore could result in leaving behind concentrations above the CUL (as much as 22,917 µg/kg TPAH) that would be expected to naturally attenuate.

25.2 Draft Response

As stated in the Responsiveness Summary to the ROD, interim targets for risks and HIs were developed for feasibility study purposes because a long-term model is not available to predict the time to meet the PRGs. The interim targets were used to evaluate each alternative's effectiveness in achieving cleanup goals in a reasonable time frame among other matrices. The environmental processes that support natural recovery are present in the river (incoming sediment loads promoting burial and dilution, contaminant declines through dispersion, and degradation of some compounds) and will be hastened when in-river and upland sources of contamination are eliminated. However, the complex nature of the Site and the limited data set to demonstrate the rate of improvement in water, sediment, and fish tissue contaminant concentrations restrict the ability to make quantitative determinations of contaminant declines following remediation based on empirical analyses or mechanistic modeling. Therefore, estimates of the post-remediation condition were used in the FS and ROD to gauge environmental improvement from remedial action. Although the ESD did not evaluate risk against the interim targets presented in the FS and ROD, the ESD considered potential interim (post-construction) and long-term impacts regarding whether remaining risks could be achieved through monitored natural recovery.

The ESD considered the effect of increasing the total PAH RAL on post construction risk estimates. That analysis shows that even though risk from BaP is lower, given the other COCs collocated with BaP increasing the nearshore RAL for total PAHs increases overall post-construction risk, albeit these increases were minimal. Further increases in total PAH RALs proposed by the commenters (such as the 88,000 µg/kg suggested by the Port of Portland and the 95,000 µg/kg suggested by Miller Nash Graham) would increase post-construction risk more and may affect the ability of the remedy to attain other RAOs specified in the ROD. As discussed in the ESD, a total PAH RAL of 95,000 µg/kg would only protect 22% of nearshore half-river miles, while a total PAH RAL of 30,000 µg/kg will protect 100% of the nearshore half-river mile by achieving the updated direct contact cPAH CUL of 774 µg/kg as measured on one-half rolling river mile. The ESD evaluation considered both the tribal fisher and recreational beach exposure scenarios (RAO 1) and other RAOs where PAHs are identified as a COC (RAOs 2, 3, 5 and 7).

Anticipating future updates to AWQC criteria is beyond the scope of the ESD. Future updates to toxicity and water quality criteria, if implemented by the federal and state governments, will be considered during the 5-year review process or whenever EPA determines its appropriate. Please see Response #22 for further discussion regarding the 5-year review process and Response #16 regarding the water quality standards.

Regarding potential use of the lower Willamette River as a domestic water source post the remediation efforts, EPA has implemented the use of maximum contaminant levels (MCLs) as cleanup levels for contaminants of concern in surface water and groundwater. MCLs are relevant and appropriate under the circumstances of the release at Portland Harbor because the designated uses of the lower Willamette River include drinking water supply (as designated in the Uses for the Willamette Basin specified for the Willamette Basin at OAR 340-041-340 and 340-041-0345). Likewise, all ground water of the state, including the ground water adjacent to and under the lower Willamette River, are to be protected for the beneficial use of domestic drinking water supply.

As noted in the comment, the evaluations for tribal fisher exposure (RAO 1) presented in the ESD estimated that a total PAH RAL of 30,000 µg/kg will protect 100% of the nearshore half-river mile by achieving the updated direct contact cPAH CUL of 774 µg/kg (ESD Table 1) as measured on one-half rolling river mile SWACs throughout the Site. EPA disagrees that the updated total PAH RAL of 30,000 µg/kg will result in remediation of sediments that do not pose unacceptable risk to human health and the environment. PAHs at and above the 30,000 ug/kg RAL present unacceptable risk to human health and the environment. In addition, PAHs are co-located with other COC cleanup levels that also contribute to unacceptable risks and non-cancer hazards exceeding EPA's acceptable thresholds as outlined below. Further increases in total PAH RALs proposed by the commenters would result in further increases in post construction risk relative.

EPA evaluated the effect of the change on the ability of the remedy to achieve the RAOs established for the site considering all COCs. For reference, EPA's goal of protection for cancer risk is 10-6. An excess lifetime cancer risk of 1 x 10-6 indicates a probability that the reasonable maximally exposed (RME) individual has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other exposures. The upper-bound excess lifetime cancer risks derived in this assessment are compared to the risk range of 10-4 to 10-6 established in the NCP. This evaluation demonstrated a slight increase in post-construction risk for all RAOs as summarized below:

- RAO 1: A slight increase in post construction risk was observed. For example, at RM 6.5 West, post-construction direct contact human health risks are estimated to increase from 6 x 10-7 to 1 x 10-6, whereas at RM 4.5 East, post-construction risks are estimated to increase from 2 x 10-6 to 3 x 10-6 (ESD Table 2).
- RAO 2: A slight increase in post construction risk was observed. For example, at RM 6.5 West, post-construction risks are estimated to increase from 2 x 10-5 to 4 x 10-5, whereas at RM 4.5 East, post-construction risks are estimated to increase from 8 x 10-5 to 1 x 10-4 (ESD Table 3). Post-construction non-cancer hazard indices quotients also increase. The largest estimated hazard index increases are from 0.8 to 1.7 for a child and from 25 to 48 for an infant at RM 6.5 (ESD Table 3).
- RAO 5: Revising the total PAH RAL will reduce the percentage of the Site achieving 10 times the benthic risk CULs from 72% to 69% of the Site following construction (ESD Table 4). Since the ROD goal is to protect 50% of the benthic risk area defined by 10 times benthic PRGs, the post construction benthic risk reduction goal established in the ROD is achieved regardless of the TPAH RAL adjustment.
- RAO 6: Revising the total PAH RAL will slightly increase risks to fish and wildlife through prey consumption. For example, the total hazard index increased from 1.2 to 1.5 for both SDU 4.5 East and SDU 6 West (ESD Table 5).
- RAOs 3 and 7: A slight increase in risk was observed. For example, reductions in cPAH surface water concentrations were estimated as 78% for the Selected Remedy. Based on the changes to the Selected Remedy, the reduction in cPAH surface water concentrations is estimated as 77% (ESD Table 6).

- RAOs 4 and 8: The area of groundwater plumes addressed by the in-water portion of the updated remedy following construction is estimated to be reduced from 39% to 32% (ESD Table 7).

This evaluation demonstrates that although the updated RAL was based on achieving a 1 x 10-6 direct contact risk level following construction completion, the net effect of the ESD change is a slight increase in overall post construction risk. EPA determined that to increase the total PAH RAL above 30,000 µg/kg would result in an unacceptable increase in overall risk relative to the selected remedy for RAOs 1,2,3,5, 6, and 7.

A multiple line of evidence evaluation of natural recovery processes at the Site determined that the navigation channel between RM 5 and RM 7 is generally not conducive to natural recovery. As a result, EPA determined that increasing the navigation channel RAL above 170,000 µg/kg may limit the ability of the remedy to achieve the total PAH CUL of 23,000 µg/kg for protection of the benthic community (RAO 5) over time.

As noted in the comment, the ROD found that natural recovery was less certain in RM 6 – 8. SDUs RM 6NAV and RM 11E are scored unfavorable for natural recovery due to the lack of consistent deposition, the concentration of surface sediments relative to subsurface sediments, the lack of fine-grained materials and the potential for anthropogenic disturbance through propwash or maintenance dredging activities. Natural recovery processes are neutral for the remainder of the areas. This conclusion supports EPA's determination that the total PAH RAL should not be revised upward in the Navigation Channel.

EPA has reviewed the recently collected sediment data collected from the navigation channel between RM 5 and 7. As noted in the comment, the bathymetric survey from 2018 shows between 7.5 cm to greater than 30 cm of erosion throughout a significant portion of navigation channel between RM 5 and 7. This information indicates that natural recovery processes are generally unfavorable within the navigation channel between RM 5 and RM 7 where the total PAH RAL is exceeded and further supports EPA's decision not to adjust the navigation channel total PAH RAL of 170,000 µg/kg specified in the ROD.

26.0 Exposure assumption challenges and Institutional controls

26.1 Comments

The comments suggest that the clam consumption exposure scenario is incomplete at Terminal 4 (T4) due to: restricted site access (the site is patrolled 24 hours per day and 7 days per week), marine traffic (Berths 410 and 411 in Slip 3 have an 80% vessel occupancy rate, physically obstructing public access), and prevailing water depths at the terminal (the depths would require the clams to be harvested by divers, thus providing further impediment to access and harvesting of clams). In addition, the clam consumption sediment cleanup level was based on the consumption of 3.3 grams per day of clams for 350 days/year (approximately 2.5 pounds per year); it would be difficult for the public to access T4 regularly to harvest enough clams to achieve this consumption rate.

The comments also note that existing institutional controls are in place to prohibit clam harvesting at T4 and other parts of the harbor. Oregon law (Oregon Administrative Rule 635-056-0000) prohibits the possession, transportation, and sale of non-native wildlife, and the

predominant species found in the Lower Willamette River during Remedial Investigation sampling events were Asian clams (Corbicula fluminea), which are an invasive, non-native species. In addition, Oregon Sport Fishing Regulations state that it is illegal to harvest or possess any freshwater clams and mussels (ODFW 2018). This is a statewide regulation.

The commenter states that there is considerable uncertainty in the clam consumption-based sediment cleanup level of 1,076 ug/kg for cPAHs because it was derived using a statistically weak correlation between sediment and clam tissue for benzo(a)pyrene (regression coefficient [r2] = 0.36; Windward 2015).

The comment also notes that using the updated benzo(a)pyrene CSF in the BHHRA calculation for RM4E, where T4 is located, the central tendency exposure scenario (CTE) would have reduced the risk to $3x10^{-7}$, which is less than the threshold of 10^{-6} and would not be considered an unacceptable health risk.

In addition, cPAH represents only a small portion of the RAO 2 cumulative risk and should therefore not have a disproportionate focus in the allocation of cleanup resources.

The commenter requests that EPA consider making site-specific risk management decision claiming that human clam-consumption risk is inapplicable to the remedy selection and design at T4.

26.2 Draft Response

Regarding the completeness of the clam consumption exposure scenario, EPA addressed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.3.6): "EPA… disagrees that the shellfish consumption pathway is not complete for the navigation channel. The commenter has not provided any information to support this statement, and there is no prohibition on collecting shellfish from within the navigation channel." EPA also discussed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.6.1): "Although the commenter states that human consumption of shellfish is an exposure scenario that cannot occur in the navigation channel because no one goes clamming in 50 feet of water in the middle of the river, there is no information to support this claim." In addition, although the navigation channel is federally maintained at 40 feet, there are no assurances that the current depths in other parts of the harbor will be maintained into the future. EPA also discussed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.19.6): "Due to potential changes in future land and waterway uses, the recreational use of the river, and inappropriate reliance on ICs (security controls), EPA did not take into account shipping and security controls during the evaluation of risk or in the development of remedial action alternatives. It should be noted that while the Portland Harbor Site is designated for industrial uses, it also serves as a resource for recreational and subsistence fishing. Regarding the development of location specific remedial cleanup levels as was done for the Lower Duwamish Waterway Site, EPA notes that location specific PRGs have been developed for PAHs. For example, PRGs for RAO 2 apply throughout the Site while PRGs for RAO 1 only apply to nearshore areas."

While fences could be used to address the shoreline access, the site is on an open river, and fences do not prevent water-ward access to the site (e.g. Tribal Fishers fishing with nets). In addition, Oregon statutes provide that "[a]ll water within the state from all sources of water supply belongs to the public." OR. Stat. Rev. § 537.110. There is no clear indication of circumstances under which the state or federal government might be able to block access from the water side by the public (or Tribes) to use these areas at T4 for recreation now/or in the future.

Although T4 is a busy terminal and has restricted site access and Oregon Sport Fishing Regulations state that it is illegal to harvest or possess any freshwater clams and mussels, as stated in the BHHRA, DEQ and EPA staff have occasionally received calls from individuals who claim to have harvested clams and some transients, who were interviewed, have also reported consuming clams. Despite the prevailing water depths and the access difficulty for the public to harvest enough clams to achieve the calculated consumption rate, there is not sufficient evidence to definitively state that the clam consumption pathway is incomplete. Further, not remediating portions of T4 where fishing access is currently limited would not be technically supportable. T4 has significant hydrodynamic forces from ship berthing activities, so recontamination issues would jeopardize the effectiveness of the remedy in the long-term.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that, "The use of institutional controls shall not substitute for active response measures... as the sole remedy unless such active measures are determined not to be practicable..." 300 C.F.R. § 300.430(a)(1)(iii)(D). There is no information in EPA's record to support that implementation of institutional controls, such as access controls to large portions of the river, can be implemented or would be reliable or effective in the long-term. In the FS or ROD, long-term access controls in lieu of capping or dredging were not included or evaluated as an alternative for this stretch of river. If they were, such ICs would likely be determined to have unreliable effectiveness, not be protective of ecological exposures, be practically difficult to implement, and have unknown long-term reliability, in addition to the other challenges that option presents (e.g., future use; tribally protected treaty rights; restricting access on Oregon Department of State Lands sediments; state and public acceptance). Institutional controls would need to be adequately implemented, monitored, and enforced.

The commenter states that there is considerable uncertainty in the clam consumption-based sediment cleanup level of 1,076 ug/kg for cPAHs because it was derived using a statistically weak correlation between sediment and clam tissue for benzo(a)pyrene (regression coefficient [r2] = 0.36). As noted in the bioaccumulation modeling report (Windward, 2015), the strength of the tissue-sediment relationship developed using biota-sediment accumulation regressions (BSARs) was assessed based on the coefficient of determination (r^2). Regression models were accepted as candidate BSARs if the slope significantly different from zero ($p < 0.05$) and the r^2 was greater than 0.30 (i.e., at the minimum, a weak relationship was established). Final BSARs were selected based additional considerations including the consistency of the relationship across the range of sediment concentrations, diagnostic testing and consistency of predictions. Although the relationship between sediment and clam tissue for benzo(a)pyrene is weak, it was determined to be sufficient for the development of sediment cleanup levels based on clam tissue results for benzo(a)pyrene based on criteria established in the Bioaccumulation Modeling Report

(Windward, 2015). In addition, long-term remedy effectiveness monitoring will be conducted to evaluate the effectiveness of the selected remedy at reducing clam tissue concentrations.

As noted by the comment, reducing the benzo(a)pyrene CSF would reduce the risk from benzo(a)pyrene at RM4E, where T4 is located, to less than the threshold of 10^{-6}. However, cPAH represents only a small portion of the cumulative risk. As shown in ESD Table 2, the cumulative risk for RAO1 at RM4E shows 0% change; and in ESD Table 3, the cumulative risk for RAO2 at RM4E shows a 9% increase and should therefore not have a disproportionate focus in the allocation of cleanup resources.

Regarding the development of different cPAH cleanup levels for different areas of the Site based on land use and exposure scenarios, EPA also addressed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.3.6): "EPA notes that the direct contact cPAH PRG is only applicable to nearshore areas. For other exposure pathways, such as shellfish consumption and exposure to the benthic community, exposure may occur throughout the Site, including nearshore areas and the navigation channel." In addition, EPA also discussed this issue in the responsiveness summary section of the ROD (Part 3 – Responsiveness Summary, Section 2.6.1): "EPA agreed that applying different RALs, particularly, higher RALs upstream of lower RALs could be problematic for achieving the ultimate cleanup goals. The selected remedy applies the same remedial action levels (F RALs) throughout the Site, with the exception of the navigation channel where the remedy will target PTW and sediment contamination exceeding the Alternative B RALs because of the differences in water depth, sediment transport potential and exposure potential."